

SAFETY PRECAUTIONS

BEFORE OPERATION

- Do not start engine until transmission and control levers are positioned in neutral and handbrake is in position.
- Do not attempt to move tractor until air pressure gage indicates minimum of 90 psi.
- Do not attempt to push-start on a hill where braking will be required. Brake system may not function until engine has started and compressor has built up proper pressure.
- Disconnect battery leads at batteries before disconnecting engine electrical leads.
- Do not smoke or use open flame in vicinity when servicing batteries or testing cold weather starting aid. Batteries generate hydrogen, a highly explosive gas. Prevent starting aid fluid from contacting hot engine parts.
- Do not operate engine in an unvented enclosure unless exhaust fumes are piped outside.
- Do not move tractor until all personnel have been cleared from tractor and operating areas.
- When changing tires stand to the side. The lockring can snap out with enough force to cause serious injury.
- Do not weld fuel tanks or hydraulic tank unless all fumes have been expelled. Ground welder to frame at weld point.
- Use care during maintenance of oil pump and air brake chamber. Springs and covers can snap out with enough force to cause serious injury.
- Replace and secure covers, lids, and guards after performing maintenance checks and services. Stow tools.
- Remove lubricants from hand holds, control handles, catwalks and steps.
- When using fire extinguishers avoid breathing fumes and smoke.

WORKING OPERATION

- Look in direction of move prior to initiating movement. Be sure all personnel are clear.
- Do not allow personnel to ride on rear half, or stand at swivel point of tractor.
- Keep personnel clear of raised blade. Rupture of hydraulic line would cause blade to fall suddenly.
- Stop unit and engine when adjustments or servicing is required.
- Do not operate tractor in an enclosed area unless exhaust gases are piped outside. Inhalation of exhaust gases will result in serious illness or death.
- Do not smoke or permit an open flame near batteries or fuel tank when servicing.
- When using fire extinguisher avoid breathing fumes and smoke. Keep hands, floor, and controls free of grease, oil, or mud to avoid possible serious injury.

AFTER OPERATION

- Place operating levers in neutral position and set handbrake. Lower dozer blade to ground (when applicable) before stopping engine.
- Disconnect battery leads at batteries before disconnecting engine electrical leads.
- Replace and secure covers, lids, and guards after performing maintenance checks and services. Stow tools.
- Do not smoke or permit an open flame near batteries or fuel tank when servicing.
- Remove lubricants from hand holes, control handles, catwalks and steps.
- Do not operate engine in an unvented enclosure unless exhaust fumes are piped outside.
- When changing tires, stand to the side. The lockring can snap out with enough force to cause serious injury.
- Do not weld fuel tank or hydraulic tank until all fumes have been expelled. Ground welder to frame at weld point.

CHANGE }
No. 3 }

HEADQUARTERS
DEPARTMENT OF THE
WASHINGTON, D.C., 8 July

Operator and Organizational Maintenance Manual

TRACTOR, WHEELED, INDUSTRIAL: DIESEL DRIVEN; MED DBP, W/DOZER, W/SCARIFIER, W/DRAWBAR, TRAILER PINTLE AND HYDRAULIC SCRAPER CONTROLS (CLARK MODEL 290M) FSN 2420-088-9384

TM 5-2420-206-12, 19 March 1970, is changed as follows:

Inside Front Cover. Add the following warnings to the list of safety precautions:

WARNING

Operation of this equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F. - 138°F.

Page 1-1. Paragraph 1-2b is superseded as follows:

b. You can help to improve this manual by calling attention to errors and by recommending improvements. Your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) should be mailed direct to Commander, US Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120. A reply will be furnished direct to you.

Page 2-1. Immediately after Chapter 2 title, add the following warning:

WARNING

Operation of this equipment presents a

noise hazard to personnel to the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

Page 3-1. Immediately after Chapter 3 title, add the following warning:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F. - 138°F.

Page 3-1, paragraph 3-4. Add subparagraph as follows:

f. *Engine Oil Level.* Check crankcase to insure engine has oil in it. Start engine and let idle for five minutes. Stop engine and wait 30 minutes. Check oil level and add oil at this time to bring the proper level on the dipstick.

Paragraph 3-5a is superseded as follows:

a. *Filters.* Service engine oil system filter illustrated in figure 3-1. After servicing, start engine and check filters for leaks. Stop engine. Wait five minutes, then check if engine oil level is up to mark on dipstick. Check gages for proper pressure (sheet 1 of 6, fig. 2-7).

Page 3-12. Under "COOLANT SYSTEM" add "Security of hardware mounted items", and refer following to table 3-1.

Interval					H Before operation		A After operation		M Monthly	
Operator					D During operation		W Weekly		Q Quarterly	
Daily			W	M	Q	Item to be inspected	Procedure	Reference		
B	D	A								
						Water pump	Remove plug and inspect for lubrication. NOTE Grease cavity in water pump is to be one-half to two-thirds full. If accidentally overfilled, remove fitting to relieve pressure and run engine until a sufficient amount of grease has discharged. Over-lubrication can damage the seal.			

4-1. Immediately after Chapter 4 title, add the following warning:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or

excessive heat. Flash point of solvent is 100°F.- 135°F.

Page A-1, paragraph A-4. Add the following reference: "TB MED 251, Noise and Conservation of Hearing".

Order of the Secretary of the Army:

Special:
ERNE L. BOWERS
Major General, United States Army
The Adjutant General

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Distribution:
 To be distributed in accordance with DA Form 12-25A. (qty req block no. 893) Operator maintenance requirements for Warehouse
 equipment.

324-274

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Change

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C.

**Operator and Organizational Maintenance Manual
TRACTOR, WHEELED, INDUSTRIAL: DIESEL DRIVEN;
MED DBP, W/DOZER, W/SCARIFIER, W/DRAWBAR,
TRAILER PINTLE AND HYDRAULIC SCRAPER CONTROLS
(CLARK MODEL 290M) FSN 2420-088-9384**

TM 5-2420-206-12, 19 March 1970, is changed as follows:

Page 2-1. Paragraph 2-1e is added as follows:

e. A list of maintenance and operating supplies required for initial operation of the tractor is in table 2-1.

Table 9-1. Maintenance and Operating Supplies

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(5) Quantity required for normal operation	(6) Notes
ENGINE CASE	9150-680-1099 (2)	HDO 30	40 qt	(3)	(1) Includes quantity of oil to fill engine oil system as follows: 36 qts - crankcase
	9150-680-1102 (2)	HDO 10	40 qt	(3)	4 qts - oil filter
	9150-242-7603 (2)	OES	40 qt	(3)	(2) See FSC C9100L for additional data and requisitioning procedure.
FUEL TANK	9140-286-5294 (2)	FUEL OIL, DIESEL: Bulk as follows: DF-2 Regular Grade	196 gal	(4)	(3) See current LO for grade application and replenishment intervals.
	9140-286-5286 (2)	DF-1 Winter Grade	196 gal	(4)	
	9140-286-5283 (2)	DF-A, Arctic Grade	196 gal	(4)	(4) Tank capacity.
ENGINE STARTING AID SERVOID CONTROL	2910-565-9424	CYLINDER, FUEL	1		
	9150-265-9428 (2)	OIL, LUBRICATING: 5 gal can as follows: OE-10	2 oz	(3)	
	9150-242-7603 (2)	OES	2 oz	(3)	
ENGINE RESERVOIR	9150-265-9428 (2)	OIL, LUBRICATING OE-10	2 qt ea	(3)	
	9150-242-7603 (2)	OES	2 qt ea	(3)	
	9150-265-9428 (2)	OIL, LUBRICATING OE-10	5 qts	(3)	
ENGINE OIL BOX	9150-242-7603 (2)	OES	5 qts	(3)	
	9150-265-9428 (2)	OIL, LUBRICATING OE-10	72 qts	(3)	
	9150-242-7603 (2)	OES	72 qts	(3)	
TRANSMISSION AND TORQUE CONVERTER	9150-265-9428 (2)	OIL, LUBRICATING OE-10	500	(3)	
	9150-242-7603 (2)	OES	500	(3)	
	9150-265-9428 (2)	OIL, LUBRICATING OE-10	500	(3)	
HYDRAULIC RESERVOIR	9150-265-9428 (2)	OIL, LUBRICATING OE-10	500	(3)	
	9150-242-7603 (2)	OES	500	(3)	
	9150-265-9428 (2)	OIL, LUBRICATING OE-10	500	(3)	

Table 2-1. Maintenance and Operating Supplies — Continued

(1) Component Application	(2) Federal stock number	(3) Description	(4) Quantity required initial operation	(5) Quantity required 1/8 hr operation	(6) Notes
REAR	6850-174-1806	ANTIFREEZE, 55 gal drum as follows: Compound Arctic	84 qts		
	9150-577-5844 (2)	LUBRICATING OIL, GEAR, 5 gal drum as follows: GO-90	34½ qts ea	(3)	
	9150-257-5440 (2)	GOS	34½ qts ea	(3)	
TARIES FRONT AND	9150-577-8544 (2)	LUBRICATING OIL, GEAR, 5 gal drum as follows: GO-90	13 qts ea	(3)	
	9150-257-5440 (2)	GOS	13 qts ea	(3)	
	9150-190-0907 (2)	GRFSE, AUTOMOTIVE AND ARTIL- LERY, 35 lb pail as follows. GAA		(3)	
E POINTS					

APPENDIX B

BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

B-1. Scope

This appendix lists items required by the operator for operation of the tractor.

B-2. General

This list is divided into the following sections:

a. *Basic Issue Items List* Section II. Not applicable.

b. *Items Troop Installed or Authorized List* — Section III. A list of items in alphabetical sequence, which at the discretion of the unit commander may accompany the tractor. These items are NOT subject to turn-in with the tractor when evacuated.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR):

(1) Source Code, indicates the source for the listed item. Source codes are:

Code	Explanation
P	Repair parts, special tools and test equipment supplied from GSA, DSA or Army supply system and authorized for use at indicated maintenance levels.
P2	Repair parts, special tools and test equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.

(2) Maintenance Code, indicates the lowest level of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Crew/Operator

(3) Recoverability Code, indicates whether serviceable items should be returned for repair or salvage. Items not coded are non-recoverable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts (assemblies and components), special tools and test equipment which are economically repairable at direct and general maintenance levels.
S	Repair parts, special tools, test equipment and assemblies which are economically repairable at GSU activities and which normally are furnished by supply on an exchange basis.

b. *Federal Stock Number*. This column indicates the Federal stock number assigned to the item which will be used for requisitioning purposes.

c. *Description*. This column indicates the Federal item name and any additional description of the item required.

d. *Unit of Measure (U/M)*. A 2 character alpha-numeric abbreviation indicating the amount or quantity of the item upon which the allowances are based. ft, ea, pr, etc.

e. *Quantity Furnished With Equipment (BIIL only)*. This column indicates the quantity of item furnished with the equipment.

f. *Quantity Authorized (Items Troop Installed or Authorized Only)*. This column indicates the quantity of the item authorized to be used with the equipment.

g. *Illustration (BIIL only)*. This column is divided as follows:

(1) *Figure number*. Indicates the figure number of the illustration in which the item is shown.

(2) *Item number*. Indicates the callout number used to reference the item in the illustration.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock number	(3) Description Ref No & Mfr code	(4) Unit of meas Usable on code	(5) Qty
	7520-559-961H	CASE, MAINTENANCE AND OPERATION	EA	

By Order of the Secretary of the Army,

W. C. WESTMORELAND
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-25B (qty req block no. 489) Operator's Maintenance requirements for Tractor
ed: Medium.

US ARMY ADJUTANT GENERAL PUBLICATIONS CENTER, ST. LOUIS, MO 63105

Operator and Organizational Maintenance Manual

**TRACTOR, WHEELED, INDUSTRIAL: DIESEL DRIVEN; MED DBP,
W/DOZER, W/SCARIFIER, W/DRAWBAR, TRAILER PINTLE AND
HYDRAULIC SCRAPER CONTROLS (CLARK MODEL 290M)
FSN 2420-088-9384**

Paragraph

Chapter 1.	INTRODUCTION	1-1, 1-2
Section I.	General	1-3, 1-4
II.	Description and data	
Chapter 2.	INSTALLATION AND OPERATING INSTRUCTIONS	2-1—2-4
Section I.	Service upon receipt of material	2-5, 2-6
II.	Movement to a new worksite	2-7, 2-8
III.	Controls and instruments	2-9, 2-12
IV.	Operation under usual conditions	2-13—2-19
V.	Operation under unusual conditions	
VI.	Operation of auxiliary material used in conjunction with equipment	2-20—2-23
Chapter 3.	OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS	
Section I.	Operators and organizational maintenance repair parts, tools and equipment	3-1, 3-2 3-3—3-12
II.	Lubrication	3-13
III.	Preventive maintenance checks and services	3-14—3-16
IV.	Operator's maintenance	3-17
V.	Troubleshooting	
Chapter 4.	ORGANIZATIONAL MAINTENANCE PROCEDURES	4-1—4-8
Section I.	Bulldozer assembly	4-9—4-14
II.	Tractor lights	4-15—4-18
III.	Turbocharger	4-19—4-25
IV.	Controls and instruments	4-26—4-38
V.	Engine components	4-39—4-41
VI.	Engine timing	4-42—4-48
VII.	Steering and scraper hydraulic system	4-49—4-55
VIII.	Air hydraulic system	4-56—4-65
IX.	Tractor components	
Appendix A.	REFERENCES	
B.	BASIC ISSUE ITEMS LIST AND MAINTENANCE AND	

Title

Left front three-quarter view with shipping dimensions.

Right rear three-quarter view.

Wiring diagram.

Air system and hydraulic brake lines and fittings (sheet 1 of 3).

Air system and hydraulic brake lines and fittings (sheet 2 of 3).

Air system and hydraulic brake lines and fittings (sheet 3 of 3).

Main and transmission-converter hydraulic systems (sheet 1 of 2).

Main and transmission-converter hydraulic systems (sheet 2 of 2).

Steering hydraulic system, lines and fittings.

Engine oil lines and fittings.

Fuel lines and fittings.

Batteries, installation and removal.

Shipping lock link and wedge, removal and installation.

Tractor universal coupler brace, removal and storage.

Bulldozer lock link, removal and installation.

Tractor universal coupler, hoses and lines.

Scraper operating controls (sheet 1 of 2).

Scraper operating controls (sheet 2 of 2).

Controls and instruments (sheet 1 of 6).

Controls and instruments (sheet 2 of 6).

Controls and instruments (sheet 3 of 6).

Controls and instruments (sheet 4 of 6).

Controls and instruments (sheet 5 of 6).

Controls and instruments (sheet 6 of 6).

Tractor starting instructions.

Tractor stopping instructions.

Tractor operating instructions (sheet 1 of 2).

Tractor operating instructions (sheet 2 of 2).

Bulldozer and scarifier operating instructions (sheet 1 of 3).

Bulldozer and scarifier operating instructions (sheet 2 of 3).

Bulldozer and scarifier operating instructions (sheet 3 of 3).

Engine starting aid.

Operator seat adjustment.

Engine oil system filter service.

Engine crankcase breather service.

Fuel filter service.

Fuel tank strainer service.

Transmission and torque converter, oil filter service.

Hydraulic oil tank, element and strainer service.

Air cleaner filter service.

Water filter service.

Aneroid filter service.

Fuel pump filter service.

Bulldozer cutting edge and end bits, removal and installation.

Scarifier tooth, removal and installation.

Scarifier body, removal and installation.

Skid shoe, removal and installation.

Bulldozer lift and tilt cylinder, removal, disassembly, reassembly and installation (sheet 1 of 3).

Bulldozer lift and tilt cylinder, removal, disassembly, reassembly and installation (sheet 2 of 3).

Bulldozer lift and tilt cylinder, removal, disassembly, reassembly and installation (sheet 3 of 3).

Push beam bearing cap, removal and installation.

Bulldozer blade, push beams, and pitch strut, exploded view.

Headlight assembly and grill, removal and installation.

- 4-15 Controls and instruments, removal and installation (sheet 2 of 10).
- 4-15 Controls and instruments, removal and installation (sheet 3 of 10).
- 4-15 Controls and instruments, removal and installation (sheet 4 of 10).
- 4-15 Controls and instruments, removal and installation (sheet 5 of 10).
- 4-15 Controls and instruments, removal and installation (sheet 6 of 10).
- 4-15 Controls and instruments, removal and installation (sheet 7 of 10).
- 4-15 Controls and instruments, removal and installation (sheet 8 of 10).
- 4-15 Controls and instruments, removal and installation (sheet 9 of 10).
- 4-15 Controls and instruments, removal and installation (sheet 10 of 10).
- 4-16 Steering wheel, trailer brake control, removal and installation (sheet 1 of 2).
- 4-16 Steering wheel, trailer brake control, removal and installation (sheet 2 of 2).
- 4-17 Bulldozer control levers, removal, disassembly, reassembly and installation (sheet 1 of 2).
- 4-17 Bulldozer control levers, removal, disassembly, reassembly and installation (sheet 2 of 2).
- 4-18 Transmission control levers, removal, disassembly, reassembly, and installation (sheet 1 of 2).
- 4-18 Transmission control levers, removal, disassembly, reassembly, and installation (sheet 2 of 2).
- 4-19 Parking brake hand lever and cable, removal and installation (sheet 1 of 2).
- 4-19 Parking brake hand lever and cable, removal and installation (sheet 2 of 2).
- 4-20 Accelerator pedal and linkage, removal, disassembly, reassembly, and installation (sheet 1 of 2).
- 4-20 Accelerator pedal and linkage, removal, disassembly, reassembly, and installation (sheet 2 of 2).
- 4-21 Starter and solenoid, removal, disassembly, reassembly, and installation (sheet 1 of 2).
- 4-21 Starter and solenoid, removal, disassembly, reassembly, and installation (sheet 2 of 2).
- 4-22 Generator repair, removal and installation (sheet 1 of 2).
- 4-22 Generator repair, removal and installation (sheet 2 of 2).
- 4-23 Generator regulator, testing, removal, and installation (sheet 1 of 2).
- 4-23 Generator regulator, testing, removal, and installation (sheet 2 of 2).
- 4-24 Coolant thermostat, removal and installation.
- 4-25 Engine and turbocharger filter head, removal and installation.
- 4-26 Fuel filter head, removal and installation.
- 4-27 Fuel shut down valve, removal, disassembly, reassembly, and installation (sheet 1 of 2).
- 4-27 Fuel shut down valve, removal, disassembly, reassembly, and installation (sheet 2 of 2).
- 4-28 Aneroid, removal, disassembly, reassembly and installation (sheet 1 of 2).
- 4-28 Aneroid, removal, disassembly, reassembly and installation (sheet 2 of 2).
- 4-29 Engine speed governor, exploded view.
- 4-30 Fan drive pulley and belts, removal and installation.
- 4-31 Cylinder timing mark and timing adjustments (sheet 1 of 2).
- 4-31 Cylinder timing mark and timing adjustments (sheet 2 of 2).
- 4-32 Fuel injector, removal and installation.
- 4-33 Swivels and hydraulic lines, removal, disassembly, reassembly, and installation (sheet 1 of 3).
- 4-33 Swivels and hydraulic lines, removal, disassembly, reassembly, and installation (sheet 2 of 3).
- 4-33 Swivels and hydraulic lines, removal, disassembly, reassembly, and installation (sheet 3 of 3).
- 4-34 Hydraulic filter base, removal and installation.
- 4-35 Push start pump and valve, removal and installation.
- 4-36 Steering hydraulic cylinder, removal, disassembly, reassembly and installation (sheet 1 of 2).
- 4-36 Steering hydraulic cylinder, removal, disassembly, reassembly and installation (sheet 2 of 2).
- 4-37

- 4-39 Brake actuator and hydraulic tank, removal, disassembly, reassembly and installation (sheet 2 of 3).
- 4-39 Brake actuator and hydraulic tank, removal, disassembly, reassembly, and installation (sheet 3 of 3).
- 4-40 Brake relay air valve, removal and installation.
- 4-41 Check and protection valves and stoplight switch, removal and installation.
- 4-42 Air reservoirs, removal and installation.
- 4-43 Air horns, removal and installation.
- 4-44 Windshield wiper motor, removal and installation.
- 4-45 Propeller shaft, removal and installation.
- 4-46 Rock guards, removal and installation.
- 4-47 Batteries, removal and installation.
- 4-48 Battery box and fender, exploded view.
- 4-49 Rear fenders, removal and installation.
- 4-50 Seat support, removal and installation.
- 4-51 Seat support, exploded view.
- 4-52 Wheel hub showing fill and drain plug.
- 4-53 Tire and wheel, removal and installation.
- 4-54 Pintle, removal, disassembly, reassembly, and installation.
- 4-55 Lunette, removal, disassembly, reassembly, and installation.

CHAPTER 1 INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains instructions for the use of operating and organizational personnel maintaining the Clark Tractor Model 290M as allocated by the Maintenance Allocation Chart. It provides information on the operation, lubrication, preventive maintenance checks and services of equipment, accessories, components and attachments. It provides organizational maintenance of the equipment, shipment and administrative storage, and destruction to prevent enemy use.

b. Repair parts for organizational maintenance are listed and illustrated in TM 5-2420-206-20P. Refer to TM 740-90-1 (Administrative Storage of Equipment), for information and instructions pertaining to organizational administrative storage.

c. Refer to TM 750-244-3 (Procedures for De-

struction of Equipment to Prevent Enemy Use) for information and instructions on destruction of equipment to prevent enemy use.

1-2. Forms and Records

a. DA Forms and procedures used for equipment maintenance will be only those prescribed by TM 38-750, Army Equipment Record Procedures.

b. Report of errors, omissions and recommendations for improving this publication by the user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded to Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

Section II. DESCRIPTION AND DATA

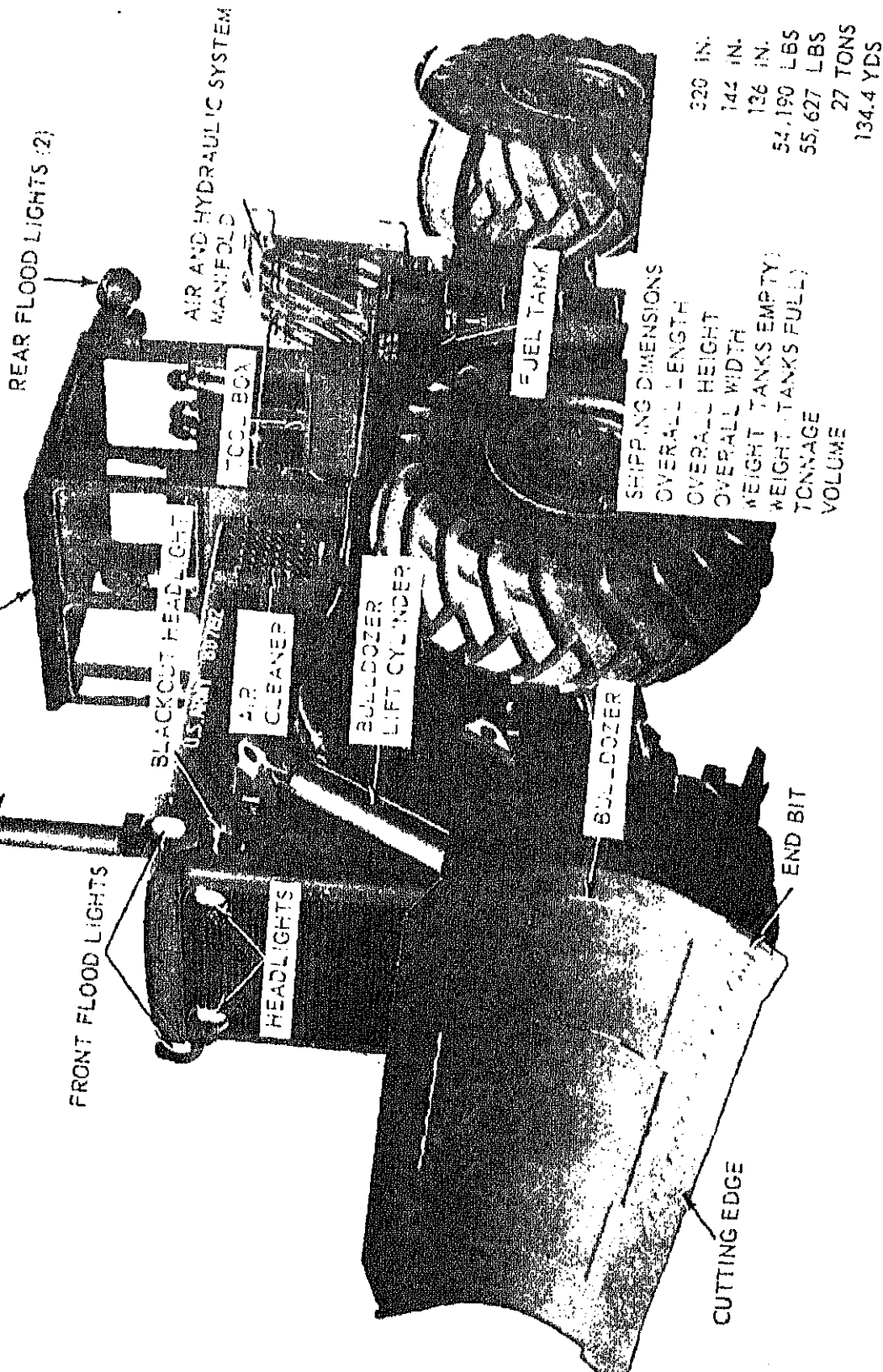
1-3. Description

a. The Clark Tractor Model 290M, figures 1-1 and 1-2, is a four wheel drive, hinged frame, industrial tractor, powered by a 6-cylinder, valve-in-head, diesel engine equipped with a turbocharger for operation of equipment at all altitudes. A hydraulically operated bulldozer/scarifier is attached to the tractor. Batteries supply 24 volt direct current power for starting tractor, lights, and engine controls. Refer to wiring diagram, figure 1-3.

b. The air system supplies controlled air pressure to individual air/hydraulic brake chambers. It applies pressure to each tractor wheel brake. The system also supplies air to brakes of towed vehicles. Refer to tractor air system, figure 1-4.

c. The tractor hydraulic system supplies controlled oil pressures to activate steering, bulldozer and towed vehicle (scraper) cylinder assemblies. Refer to hydraulic system, figures 1-5 and 1-6.

d. Refer to figures 1-7 and 1-8 for engine and fuel lines and fittings diagrams.



ME 2420-206-12 1-

SERVICE LIGHTS

AIR AND
HYDRAULIC
LINES HOSES

UNIVERSAL COUPLER

AIR LINE
COUPLINGS

RAIN CAP

BATTERY BOX

FAN FILLER
COVER

HYDRAULIC
FILTERS

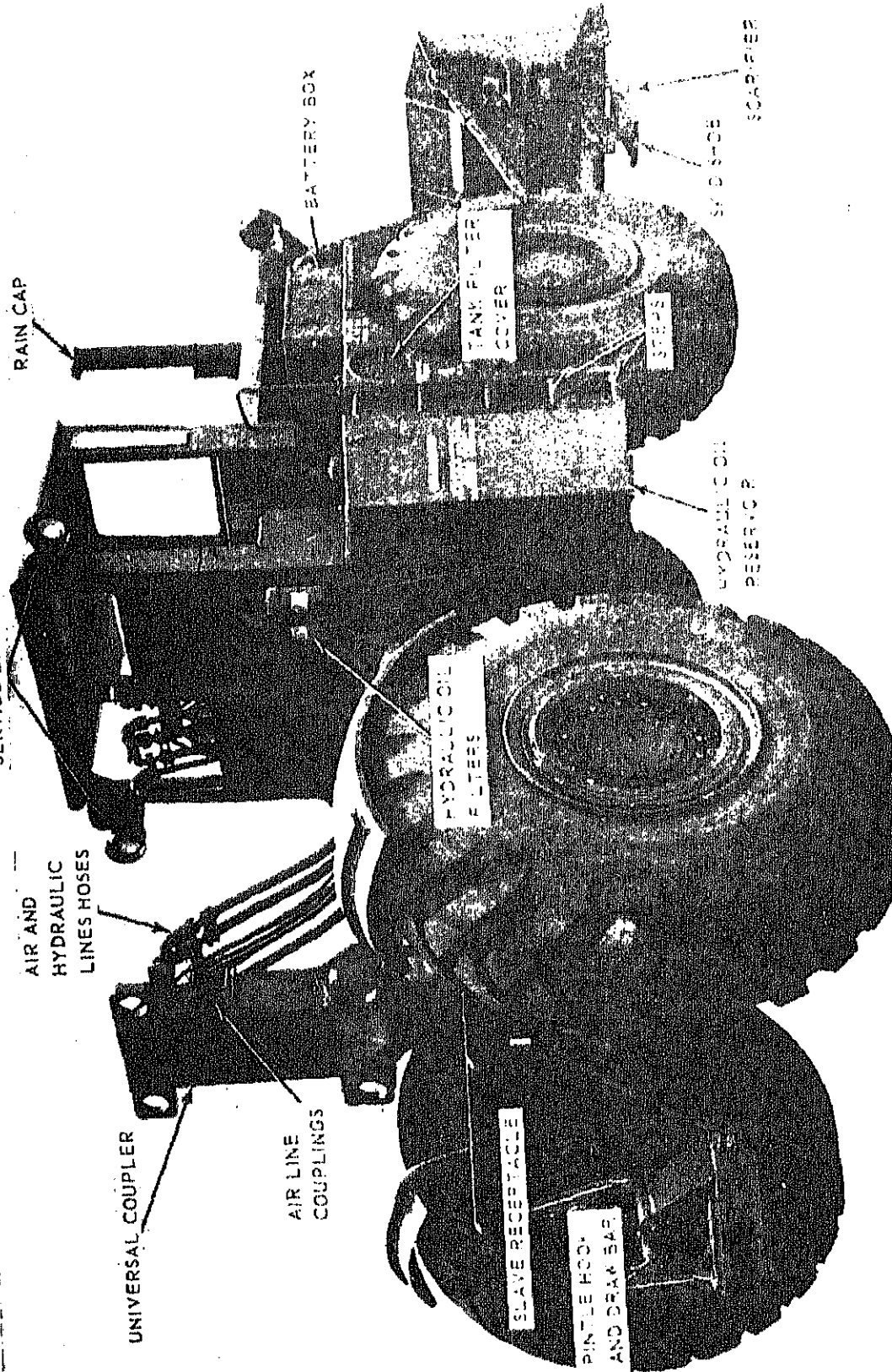
SLAVE RECEPTACLE

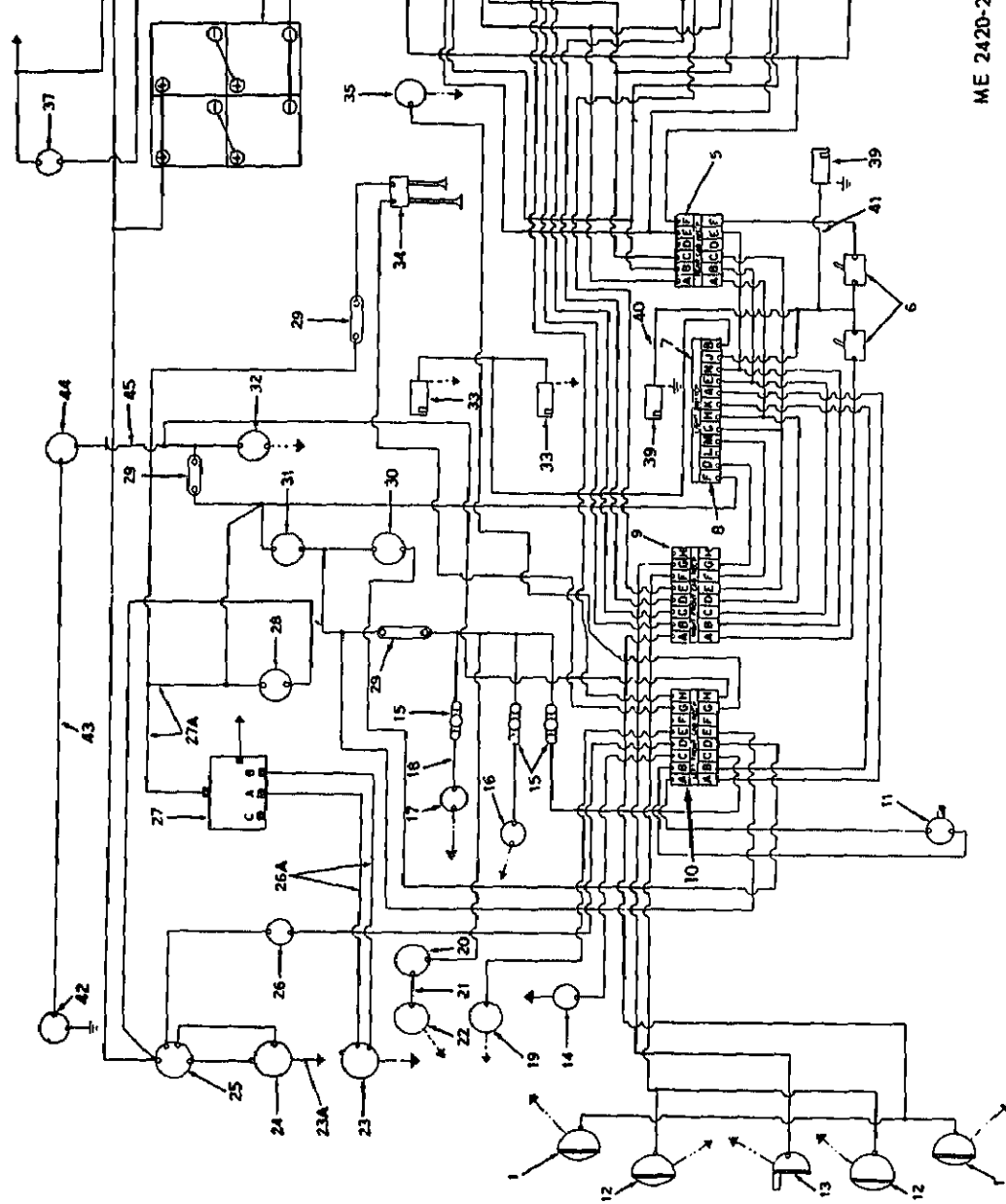
PIN 1 E HCO
AND GRAY 154P

HYDRAULIC OIL
SERVICE

SO 00 000

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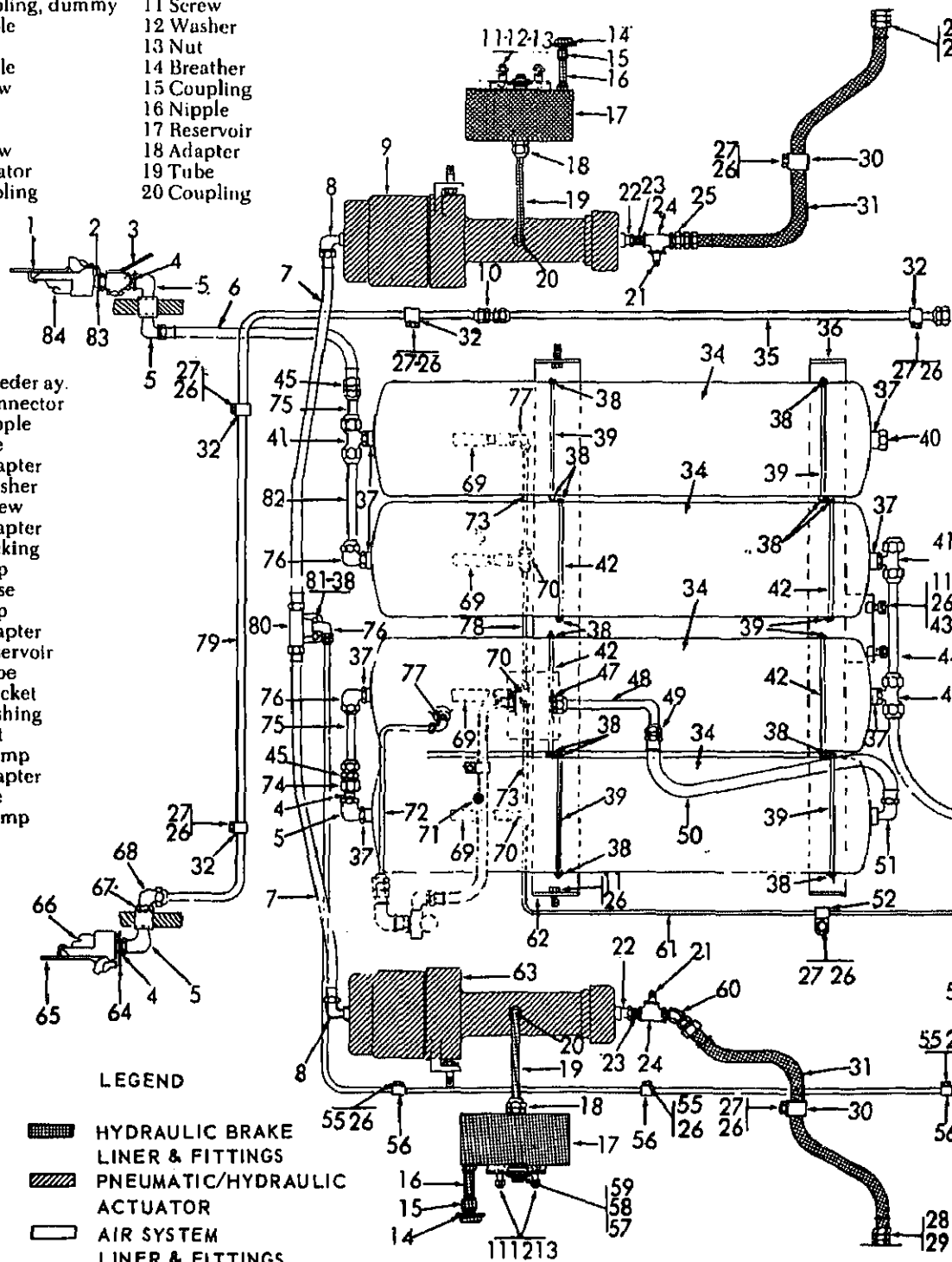







- 1 Lamp assembly
- 2 Tail and stop light
- 3 Lamp assembly
- 4 Trailer receptacle
- 5 Rear cab harness
- 6 Toggle switch
- 7 Light switch
- 8 Front cab harness
- 9 Main harness
- 10 Wiring harness
- 11 Stop light switch
- 12 Head lamp assembly
- 13 Blackout light assembly
- 14 Temperature switch
- 15 Indicator lamp
- 17 Pressure switch
- 18 Wiring harness
- 19 Fuel solenoid
- 20 Low air pressure warning switch
- 21 Cable
- 22 Low air pressure indicator
- 23 Generator
- 23A Starter-to-ground cable
- 24 Cranking motor
- 25 Solenoid switch
- 26 Neutral starter switch
- 26A Generator-to-regulator cable
- 27 Regulator
- 27A Regulator-to-ammeter harness
- 28 Ammeter
- 29 Circuit breaker
- 31 Starter switch
- 32 Selector switch
- 33 Utility outlet
- 34 Panel lamp
- 35 Horn
- 36 Horn button assembly
- 37 Battery
- 37 Master disconnect switch
- 38 Battery receptacle
- 39 Dash lamp
- 40 Dash lamp cable
- 41 Dash lamp cable
- 42 Overspeed governor
- 43 Overspeed governor to horn wire
- 44 Warning horn (overspeed)
- 45 Horn to circuit breaker wire

- 1 Coupling, dummy
- 2 Nipple
- 3 Cock
- 4 Nipple
- 5 Elbow
- 6 Hose
- 7 Hose
- 8 Elbow
- 9 Actuator
- 10 Coupling
- 11 Screw
- 12 Washer
- 13 Nut
- 14 Breather
- 15 Coupling
- 16 Nipple
- 17 Reservoir
- 18 Adapter
- 19 Tube
- 20 Coupling

- 21 Bleeder ay.
- 22 Connector
- 23 Nipple
- 24 Tee
- 25 Adapter
- 26 Washer
- 27 Screw
- 28 Adapter
- 29 Packing
- 30 Clip
- 31 Hose
- 32 Clip
- 33 Adapter
- 34 Reservoir
- 35 Tube
- 36 Bracket
- 37 Bushing
- 38 Nut
- 39 Clamp
- 40 Adapter
- 41 Tee
- 42 Clamp



LEGEND

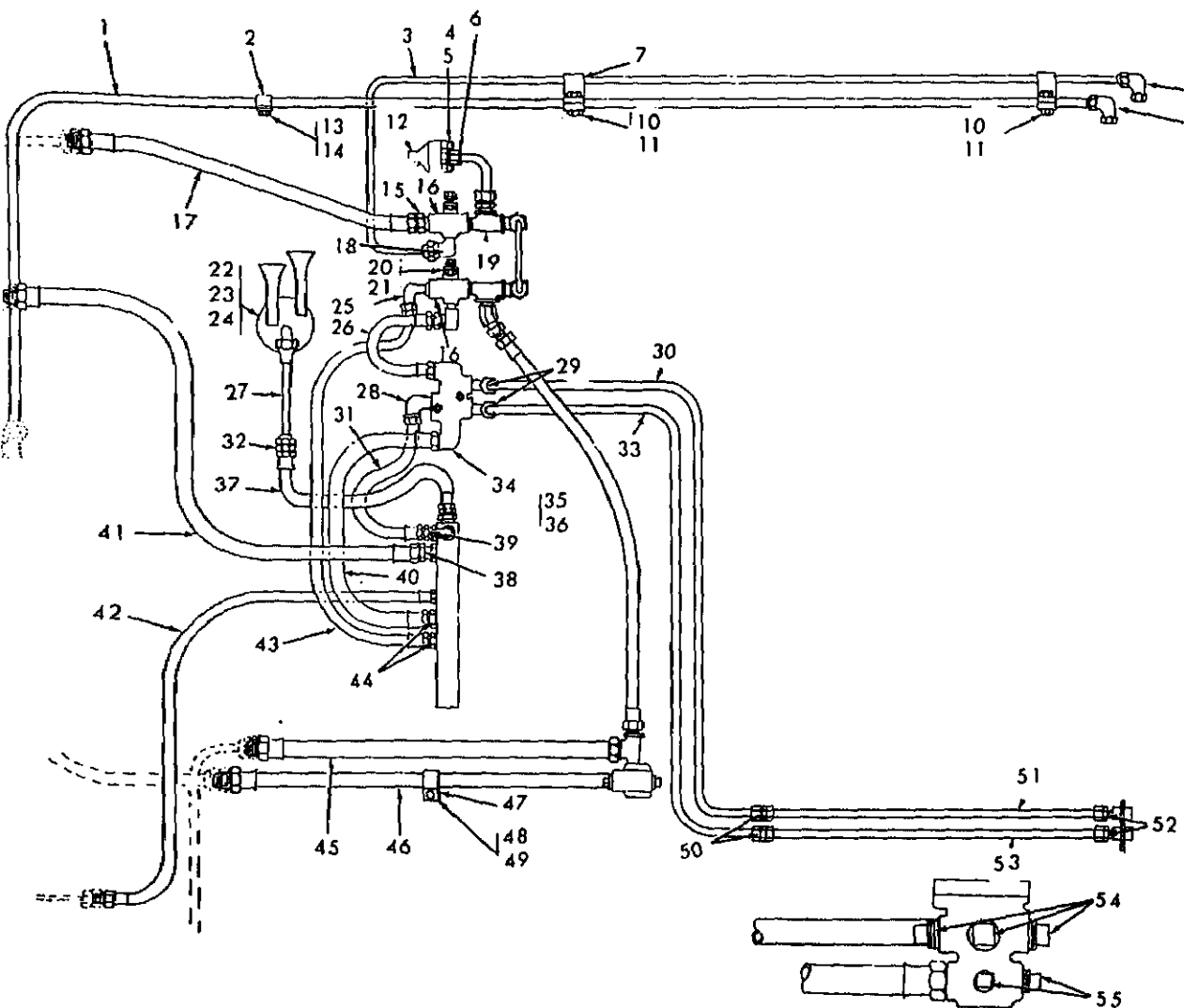
-  HYDRAULIC BRAKE LINER & FITTINGS
-  PNEUMATIC/HYDRAULIC ACTUATOR
-  AIR SYSTEM LINER & FITTINGS

- 43 Washer
- 44 Tube
- 45 Adapter
- 46 Tube
- 47 Adapter
- 48 Tube

- 55 Screw
- 56 Clip
- 57 Cap
- 58 Nut
- 59 Screw
- 60 Elbow

- 67 Bushing
- 68 Elbow
- 69 Valve
- 70 Tee
- 71 Valve
- 72 Tube

- 79 Tube
- 80 Valve
- 81 Screw
- 82 Tube
- 83 Tag
- 84 Coupling



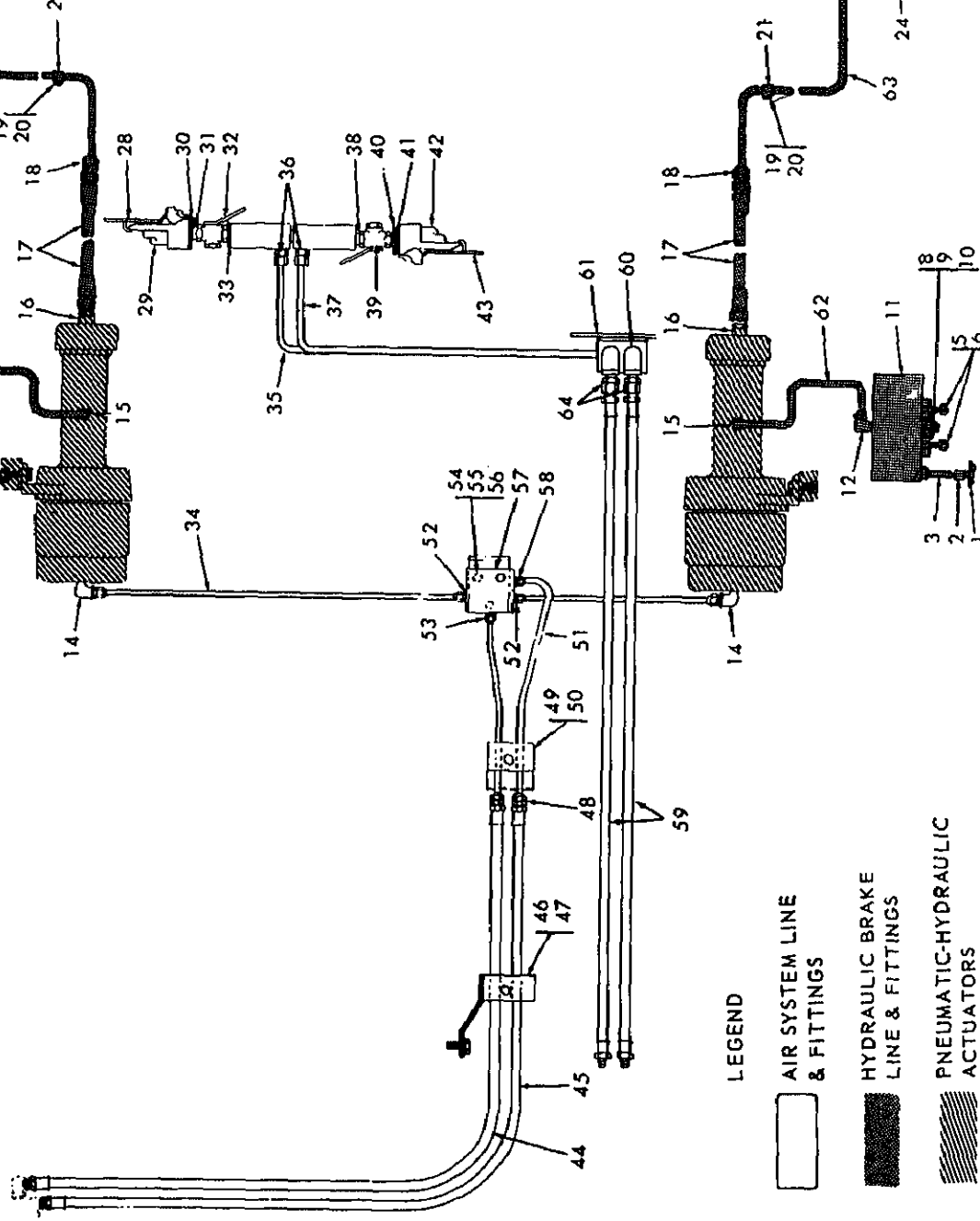
ME 2420-206-12/1-4 (2)

- 1 Tube
- 2 Clip
- 3 Tube
- 4 Capscrew
- 5 Self-locking nut
- 6 Connector
- 7 Clip
- 8 Elbow
- 9 Elbow
- 10 Capscrew
- 11 Lockwasher
- 12 Stoplight switch
- 13 Lockwasher
- 14 Capscrew
- 15 Pipe bushing
- 16 Check valve
- 17 Hose
- 18 Elbow

- 21 Self-locking nut
- 22 Capscrew
- 23 Self-locking nut
- 24 Horn
- 25 Pipe elbow
- 26 Capscrew
- 27 Self-locking nut
- 28 Hose
- 29 Tube
- 30 Pipe elbow
- 31 Pipe elbow
- 32 Tube
- 33 Hose
- 34 Straight adapter
- 35 Hose
- 36 Valve
- 37 Reducer bushing
- 38 Adapter

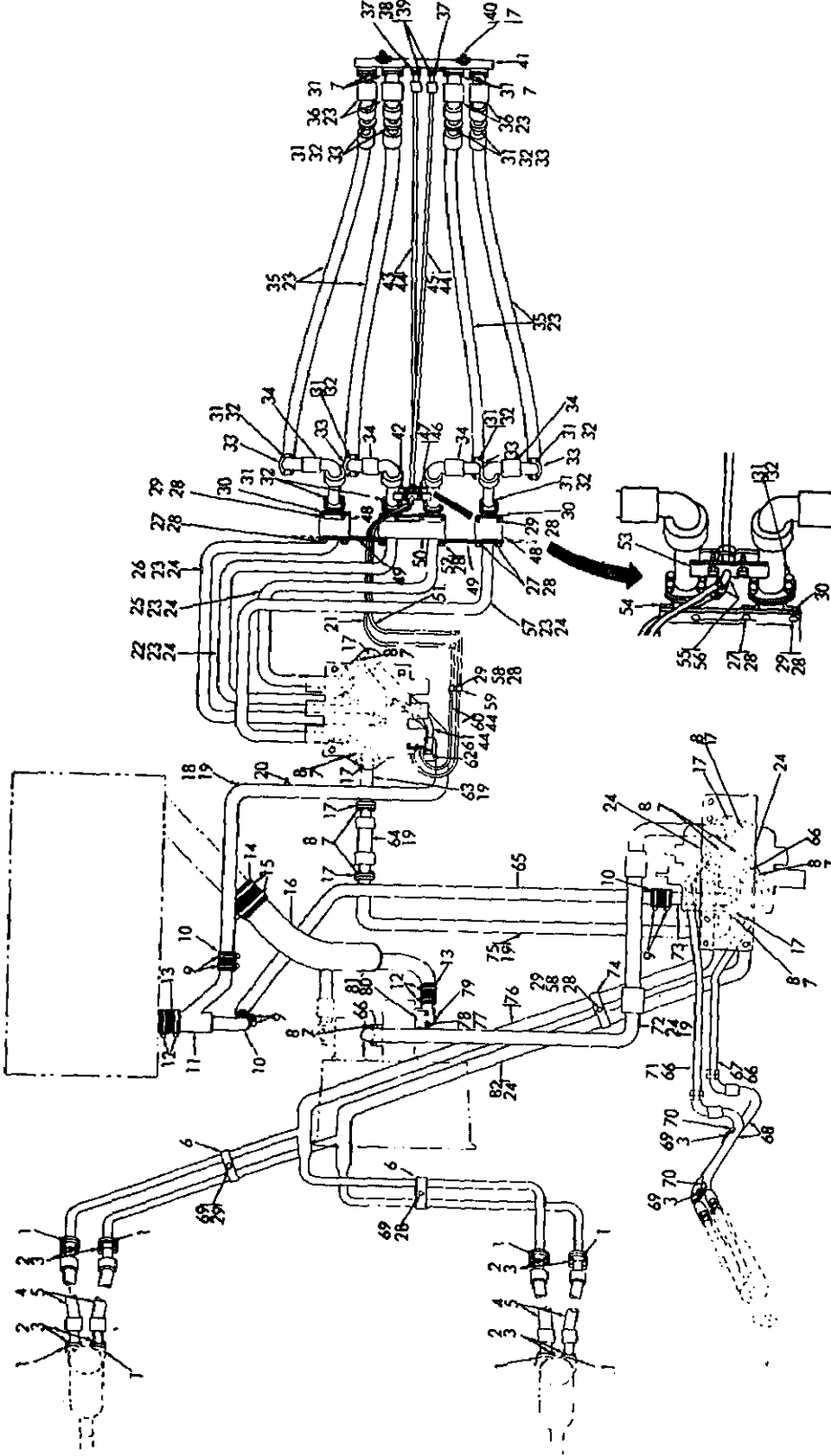
- 41 Elbow
- 42 Hose
- 43 Hose
- 44 Hose
- 45 Hose
- 46 Straight adapter
- 47 Hose
- 48 Hose
- 49 Clip
- 50 Capscrew
- 51 Self-locking nut
- 52 Connector
- 53 Tube
- 54 Elbow
- 55 Tube

3 Pipe nipple
 4 Elbow
 5 Capscrew
 6 Flat washer
 7 Self-locking nut
 8 Capscrew
 9 Nut
 10 Cap
 11 Reservoir
 12 Elbow
 13 Left hand reservoir tube
 14 Elbow
 15 Tube coupling
 16 Adapter
 17 Hose
 18 Straight adapter
 19 Capscrew
 20 Lockwasher
 21 Clip
 22 Tube
 23 Nipple
 24 Elbow
 25 Tee
 26 Inlet bleeder
 27 Connector
 28 Dummy connector
 29 Hose coupling
 30 Service tag
 31 Pipe nipple
 32 Coutout cock
 33 Pipe nipple
 34 Tube
 35 Tube
 36 Straight adapter
 37 Tube
 38 Pipe nipple
 39 Cutout cock
 40 Trailer tag
 41 Pipe nipple
 42 Hose coupling
 43 Dummy coupling
 44 Hose
 45 Hose
 46 Plate
 47 Block
 48 Straight adapter
 49 Plate
 50 Block
 51 Tube
 52 Straight adapter
 53 Connector
 54 Capscrew
 55 Connector
 56 Connector
 57 Relay valve
 58 Straight adapter
 59 Hose
 60 Elbow
 61 Bracket
 62 Right hand reservoir tube
 63 Tube
 64 Adapter



LEGEND
 [White Box] AIR SYSTEM LINE & FITTINGS
 [Black Box] HYDRAULIC BRAKE LINE & FITTINGS
 [Hatched Box] PNEUMATIC-HYDRAULIC ACTUATORS

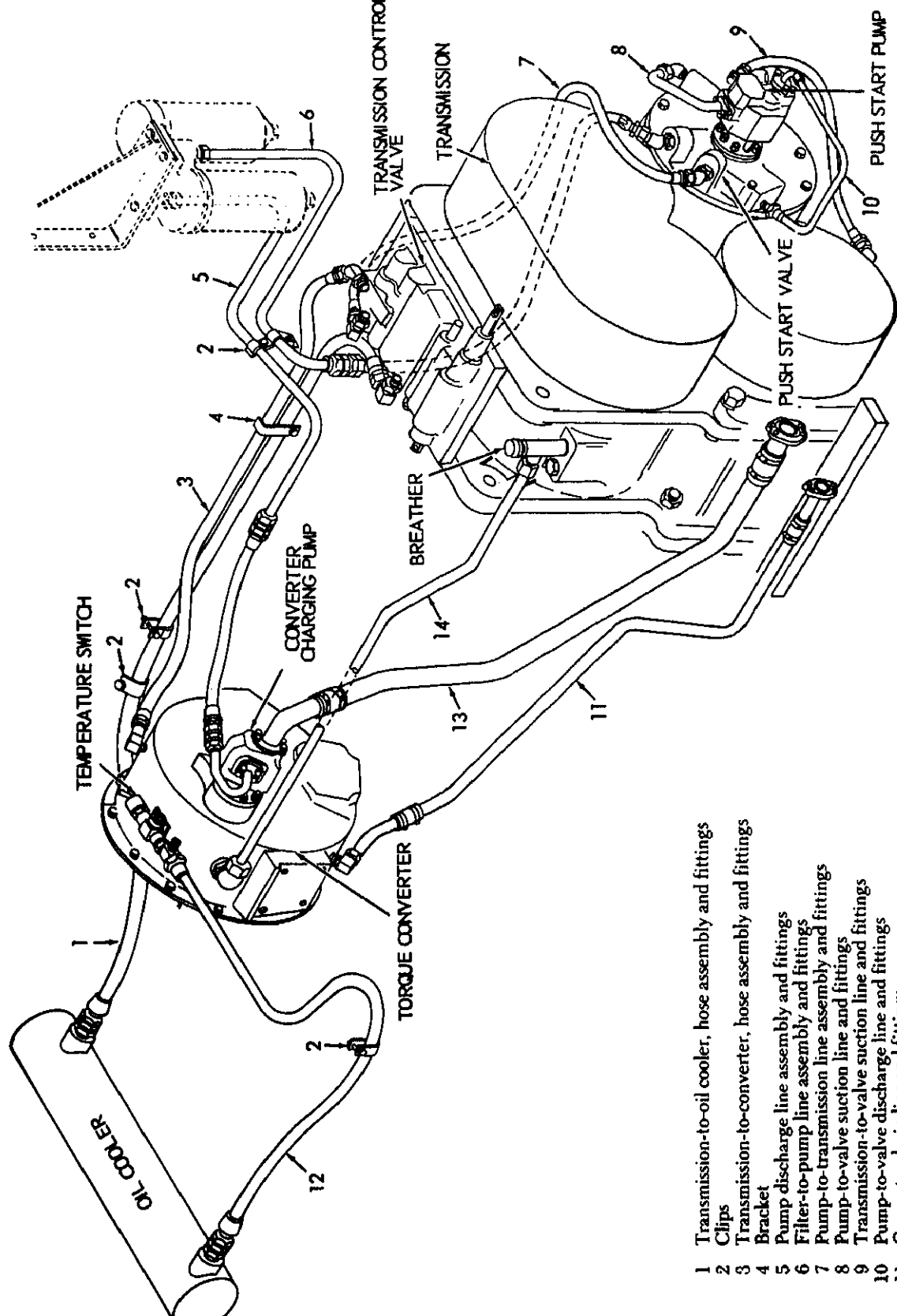
3 Pipe nipple
 4 Elbow
 5 Capscrew
 6 Flat washer
 7 Self-locking nut
 8 Capscrew
 9 Nut
 10 Cap
 11 Reservoir
 12 Elbow
 13 Left hand reservoir tube
 14 Elbow
 15 Tube coupling
 16 Adapter
 17 Hose
 18 Straight adapter
 19 Capscrew
 20 Lockwasher
 21 Clip
 22 Tube
 23 Nipple
 24 Elbow
 25 Tee
 26 Inlet bleeder
 27 Connector
 28 Dummy connector
 29 Hose coupling
 30 Service tag
 31 Pipe nipple
 32 Coutout cock
 33 Pipe nipple
 34 Tube
 35 Tube
 36 Straight adapter
 37 Tube
 38 Pipe nipple
 39 Cutout cock
 40 Trailer tag
 41 Pipe nipple
 42 Hose coupling
 43 Dummy coupling
 44 Hose
 45 Hose
 46 Plate
 47 Block
 48 Straight adapter
 49 Plate
 50 Block
 51 Tube
 52 Straight adapter
 53 Connector
 54 Capscrew
 55 Connector
 56 Connector
 57 Relay valve
 58 Straight adapter
 59 Hose
 60 Elbow
 61 Bracket
 62 Right hand reservoir tube
 63 Tube
 64 Adapter



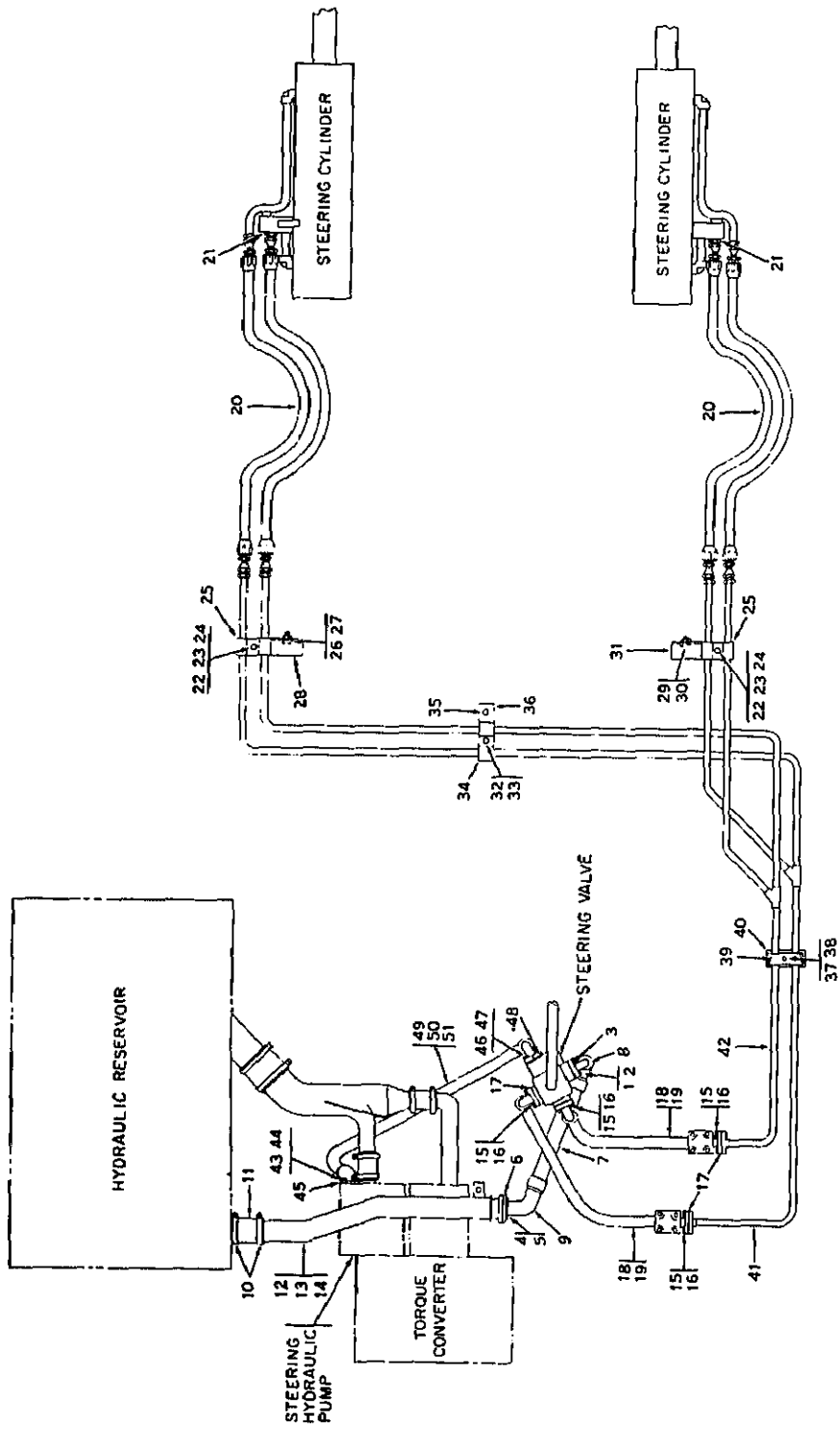
53 Plate
54 Clip
55 Elbow
56 Nut
57 Tube
58 Washer
59 Clip
60 Tube
61 Hose
62 Elbow

63 Tube
64 Hose
65 Tube
66 Flange
67 Tube
68 Hose
69 Screw
70 Tube
71 Tube
72 Hose

73 Tube
74 Clamp
75 Tube
76 Tube
77 Washer
78 Screw
79 Plug
80 Packing
81 Adapter
82 Adapter

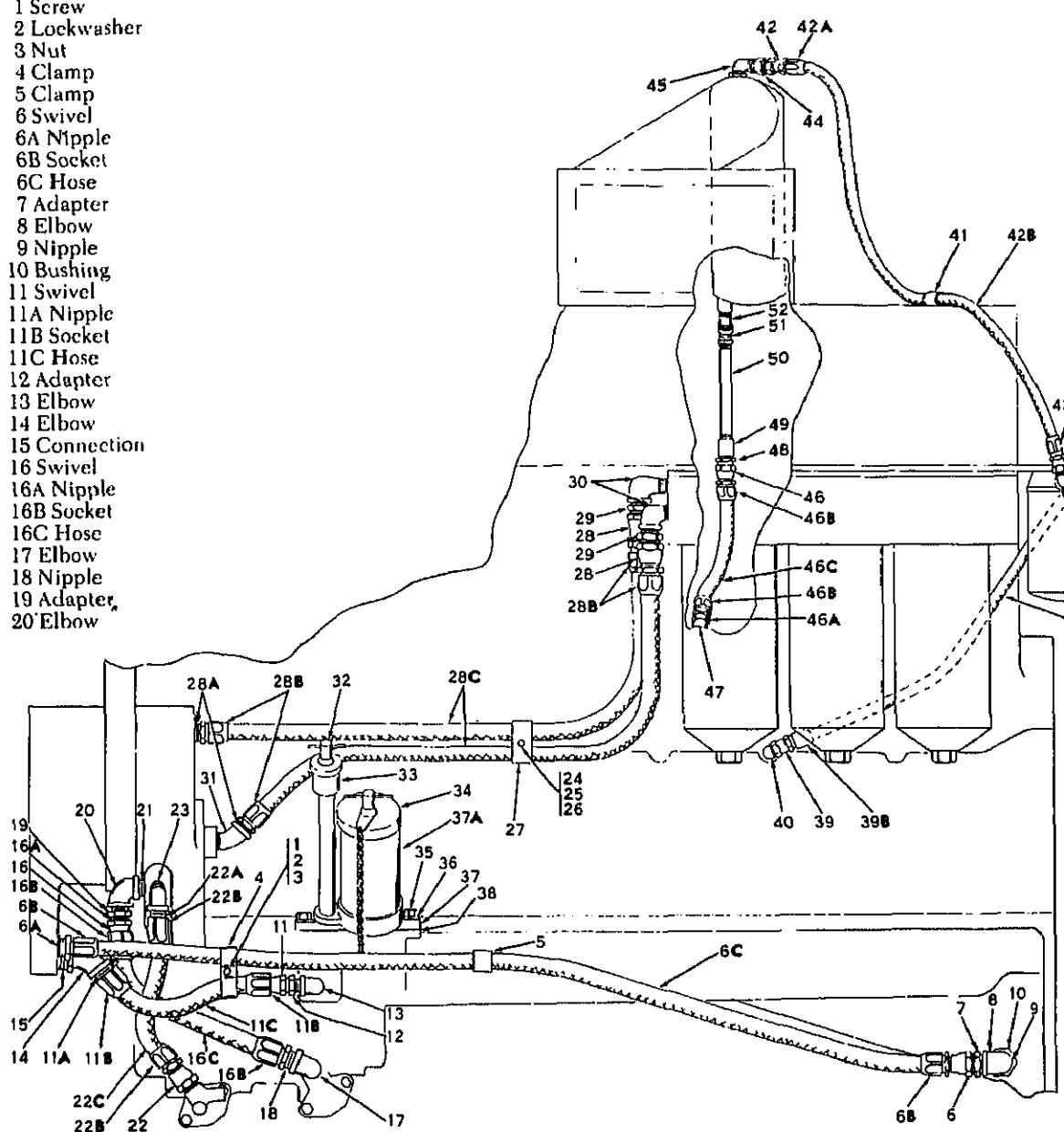


- 1 Transmission-to-oil cooler, hose assembly and fittings
- 2 Clips
- 3 Transmission-to-converter, hose assembly and fittings
- 4 Bracket
- 5 Pump discharge line assembly and fittings
- 6 Filter-to-pump line assembly and fittings
- 7 Pump-to-transmission line assembly and fittings
- 8 Pump-to-valve suction line and fittings
- 9 Transmission-to-valve suction line and fittings
- 10 Pump-to-valve discharge line and fittings
- 11 Converter drain line and fittings
- 12 Converter-to-oil cooler line and fittings
- 13 Converter pump suction line assembly and fittings
- 14 Converter-to-breather line assembly and fittings



ME 2420-206-12/1-6

- 1 Screw
- 2 Lockwasher
- 3 Nut
- 4 Clamp
- 5 Clamp
- 6 Swivel
- 6A Nipple
- 6B Socket
- 6C Hose
- 7 Adapter
- 8 Elbow
- 9 Nipple
- 10 Bushing
- 11 Swivel
- 11A Nipple
- 11B Socket
- 11C Hose
- 12 Adapter
- 13 Elbow
- 14 Elbow
- 15 Connection
- 16 Swivel
- 16A Nipple
- 16B Socket
- 16C Hose
- 17 Elbow
- 18 Nipple
- 19 Adapter
- 20 Elbow



ME 2420-206

- 21 Nipple
- 22 Swivel

- 22A Nipple
- 22B Socket
- 22C Hose
- 23 Elbow
- 24 Screw
- 25 Lockwasher
- 26 Nut

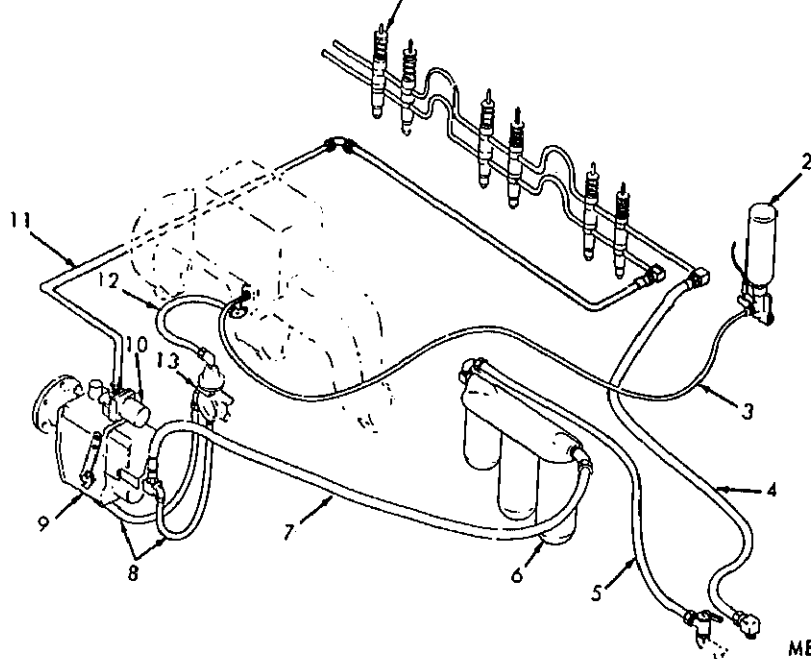
- 27 Clamp
- 28 Swivel
- 28A Nipple
- 28B Socket
- 28C Hose
- 29 Adapter
- 30 Elbow
- 31 Elbow
- 32 Dipstick
- 33 Dipstick tube

- 34 Filler cap
- 35 Capscrew
- 36 Lockwasher
- 37 Bracket
- 37A Filler tube
- 38 Gasket
- 39 Swivel
- 39A Nipple
- 39B Socket
- 39C Hose

- 40 Elbow
- 41 Hose clip
- 42 Swivel
- 42A Socket
- 42B Hose
- 43 Elbow
- 44 Connector
- 45 Elbow
- 46 Swivel
- 46A Nipple

- 46B Socket
- 46C Hose
- 47 Elbow
- 48 Adapter
- 49 Coupler
- 50 Pipe nipple
- 51 Elbow
- 52 Pipe nipple

Figure 1-7. Engine oil lines and fittings.



ME 2420-206-12

- 1 Injector
- 2 Ether starting aid
- 3 Tube
- 4 Hose
- 5 Hose
- 6 Filters
- 7 Hose
- 8 Hose
- 9 Fuel pump
- 10 Fuel shutoff solenoid
- 11 Tube
- 12 Hose
- 13 Aneroid

Figure 1-8. Fuel lines and fittings.

1-4. Identification and Tabulated Data

a. *Identification.* The tractor has seven identification plates.

(1) *U. S. Army plate.* Located in cab to right of instrument panel, specifies tractor and engine manufacturer, models, serial numbers, FSN and contract number.

(2) *Transportation data plate.* Located in cab to right of the instrument panel, specifies center of gravity and tonnage for lifting with cables.

(3) *Tractor lubrication plate.* Located next to transportation plate.

(4) *Engine plate.* Located on left front side of engine. Specifies manufacturer, model, size, and serial number.

(5) *Generator plate.* Located on generator. Specifies voltage, amperes and manufacturer.

(6) *Starter plate.* Located on starter. Specifies voltage, amperes and manufacturer.

(7) *U. S. Corp of Engineers plate.* Located on scarifier assembly. Specifies model, size and manufacturer.

b. Tabulated Data.

(1) Tractor.

Manufacturer Clark
Model 290M

(2) Engine.

Type Diesel
Manufacturer Cummins
Model No. NT380
Rotation, viewed from fan Right hand
Rated brake horsepower 350
At governed speed 2000 rpm (sea level)
Low idle speed 700 rpm
Number of cylinders 6
Firing order 1-5-3-6-2-4
Bore dia. 5 1/2 inches
Stroke 6 inches
Engine aspiration Turbocharged

(3) Engine accessories.

(a) Generator.

Manufacturer Delco-Remy
Part No. 1117478
Rating 24 volts

(b) Generator regulator.

Manufacturer Delco-Remy
Part No. 1118558
Rating 24 volts

(c) Starter.

Manufacturer Delco-Remy
Part No. 1113868
Rating 24 volts

(d) Air compressor.

Manufacturer Cummins

Manufacturer Farr
Part No. B24059
Type Dual element

(g) Turbocharger.

Manufacturer Cummins
Model No. T-590

(4) Drive systems.

(a) Torque converter.

Manufacturer Clark
Model No. C-8602-2

(b) Transmission.

Manufacturer Clark
Model No. 8420-4
Type Power shift
Speeds Four forward, two reverse
Output shafts 2

(c) Axles.

Manufacturer Clark
Model Nos.
Front 131518
Rear 131519

(5) Hydraulic system.

(a) Hydraulic pump.

Manufacturer Vickers
Model No. 45V57A-19D10A-
Type Vane

(b) Bulldozer control valve.

Manufacturer Parker-Hannifin
Model No. VDSP26DF23

(c) Main control valve.

Manufacturer Caterpillar Tractor
Part No. 4J9323

(6) Steering system.

(a) Steering gears.

Manufacturer Saginaw
Part No. 5693792

(b) Hydraulic pump.

Manufacturer Vickers
Model No. 45V47A-19B10A-
Type Vane

(7) Brake system.

(a) Brake actuators.

Manufacturer Goodrich
Model No. 228-1

(b) Wheel brakes.

Manufacturer Goodrich
Model No. 2-968

(c) Brake treadle valve.

Manufacturer Bendix-Westinghouse
Model No. 279076

(d) Relay valve.

Manufacturer Bendix-Westinghouse
Model No. R-5

(8) Tires.

Size 29.5 x 29-28 ply
Pressure 45 psi

Planetaries, front and rear (4 each) 13 qts GO each
 Aneroid control 2 oz
 Brake reservoirs, each 2 qts
 Hydraulic system 125 gal

(10) Adjustments.

Engine valve adjustment:

Intake valves cold 0.016 inch
 Intake valves hot 0.014 inch
 Exhaust valves cold 0.029 inch
 Exhaust valves hot 0.027 inch

Engine injector adjustment:

Cold setting 48 in. lb.
 Hot setting 60 in. lb.

(11) Scarifier (backripper).

Manufacturer Renner Mfg. Co.
 Type 1
 Size 4
 Bulldozer lift cylinder cap screws 50 ft. lb.

(a) Tractor.

Height 144 in. (inch)
 Length 320 in.
 Width 136 in.
 Weight 54,190 lbs. (pounds)
 Tons 27
 Volume 134.4 yd. (yard)

(b) Scraper.

Length 320 in.
 Weight (empty) 31,860 lbs.
 Capacity (load struck) 18.9 cu. yd. (cubic yd.)

(c) Bridge weights.

Tractor with tanks filled 28 tons
 Tractor and scraper with pay load 70 tons
 Tractor with scraper, empty 44 tons

(13) General Torque specification—screws. See table 1-1.

Table 1-1. General Torque Specifications — Bolts and Screws

(All torque values are given in pound feet)

Size	Threads per inch	Standard heat-treated bolts and screws	Special heat-treated bolts, screws, Allen-head screws, and self-locking capscrews
1/4	20	6-8	9-11
	28	8-10	10-12
5/16	18	15-18	17-20
	24	17-20	19-23
3/8	16	26-32	36-43
	24	33-40	41-49
7/16	14	42-50	54-65
	20	50-60	64-77
1/2	13	67-80	81-97
	20	83-100	96-115
9/16	12	85-100	103-123
	18	100-120	122-146
5/8	11	117-140	164-192
	18	134-160	193-225
3/4	10	180-210	284-325
	16	215-250	337-385
7/8	9	315-360	490-550
	14	372-425	575-650
1	8	445-500	685-770
	14	535-600	830-925

1. Inspecting and Servicing Equipment

Note. Make sure equipment is deprocessed before servicing. Make sure preservatives have been removed from such items as crankcase, tanks, gear boxes, wet clutches, and the like. Refer to DA Form 2258 attached in operator's cab.

a. Perform preventive maintenance checks and services, paragraph 3-13.

b. Inspect to see that the required tools, repair parts, publications, accessories and attachments are available with the tractor.

c. Inspect tractor for loss of parts or damage which may have occurred during loading, unloading, or shipment.

d. Report all damage and deficiencies that cannot be corrected by organizational maintenance to direct support maintenance.

2. Installation of Separately Packed Items

a. Refer to figure 2-1 and install batteries. Refer to wiring diagram (fig. 1-3) for proper cable connection. Fill batteries with electrolyte 3/8 inch above plates.

Caution: Do not splash or spill electrolyte on flesh, clothing or equipment.

b. Install seat cushions, safety belts, lever knobs, inside rear view mirrors and fire extinguisher.

c. When extreme cold weather, 32°F., 0 C., is expected, prepare tractor engine coolant system in accordance to instructions in TB-ORD-651.

Note. A water corrosion resister used in coolant system will be by-passed or element shall be removed before adding inhibited antifreeze in coolant system.

d. In freezing temperature run engine for one hour after adding water to batteries.

3. Installation or Setting Up Instructions

a. After performing lubrication, preventive maintenance checks and services and removal of tractor shipping lock links, wedges and braces, the tractor is operationally ready and able to move under its own power.

b. Refer to figure 2-2 and remove shipping lock link and wedge. Stow in tool box.

c. Refer to figure 2-3 and remove tractor universal-coupler brace.

d. Refer to figure 2-4 and remove bulldozer lock link.

2-4. Equipment Conversion

a. *General.* The tractor is equipped for operation with a material scraper attached to the universal coupler (fig. 2-5). Refer to applicable scraper technical manual when securing scraper mounting plate to tractor universal coupler.

b. *Scraper Operation.*

(1) *Loading bowl.*

(a) Move bowl and apron levers (fig. 2-6) to fully raise bowl and apron, then to hold, move ejector lever to fully lower ejector, then to hold.

(b) Move tractor transmission lever to a forward position while equipment is moving, move bowl lever to lower (slowly) to depth of material to be removed at one time, then move to hold. As filling bowl or end of material area is reached, move apron lever to lower at the same time move bowl lever to raise, then move both levers to hold.

Caution: During operation of equipment, check and remove large objects that may cause damage to equipment if operation is continued.

(2) *Move loaded bowl.*

(a) Move all scraper control levers to hold.

(b) Move tractor transmission lever to high speed position and move equipment to unloading (dumping) area.

Note. When observation reveals that loaded scraper is not trailing properly during equipment movement at high speed, stop operation and correct irregularities. Refer to applicable scraper TM.

(c) After reaching area for unloading (dumping) material, position tractor transmission lever to low forward speed.

(3) *Unloading scraper (dumping, spreading).*

(a) Move apron lever to raise position, then to hold.

(b) Lower scraper bowl to desired height (to 8 inches), move ejector lever to eject, then to hold.

(c) When unloading is completed move ejector lever to return, then hold and move bowl lever to raise, then hold, and apron lever to lower then hold for return trip to loading area. The operator may vary lever positions during dumping to aid even spreading of the load.

BATTERY (4)

CABLE TO STARTER
TERMINAL

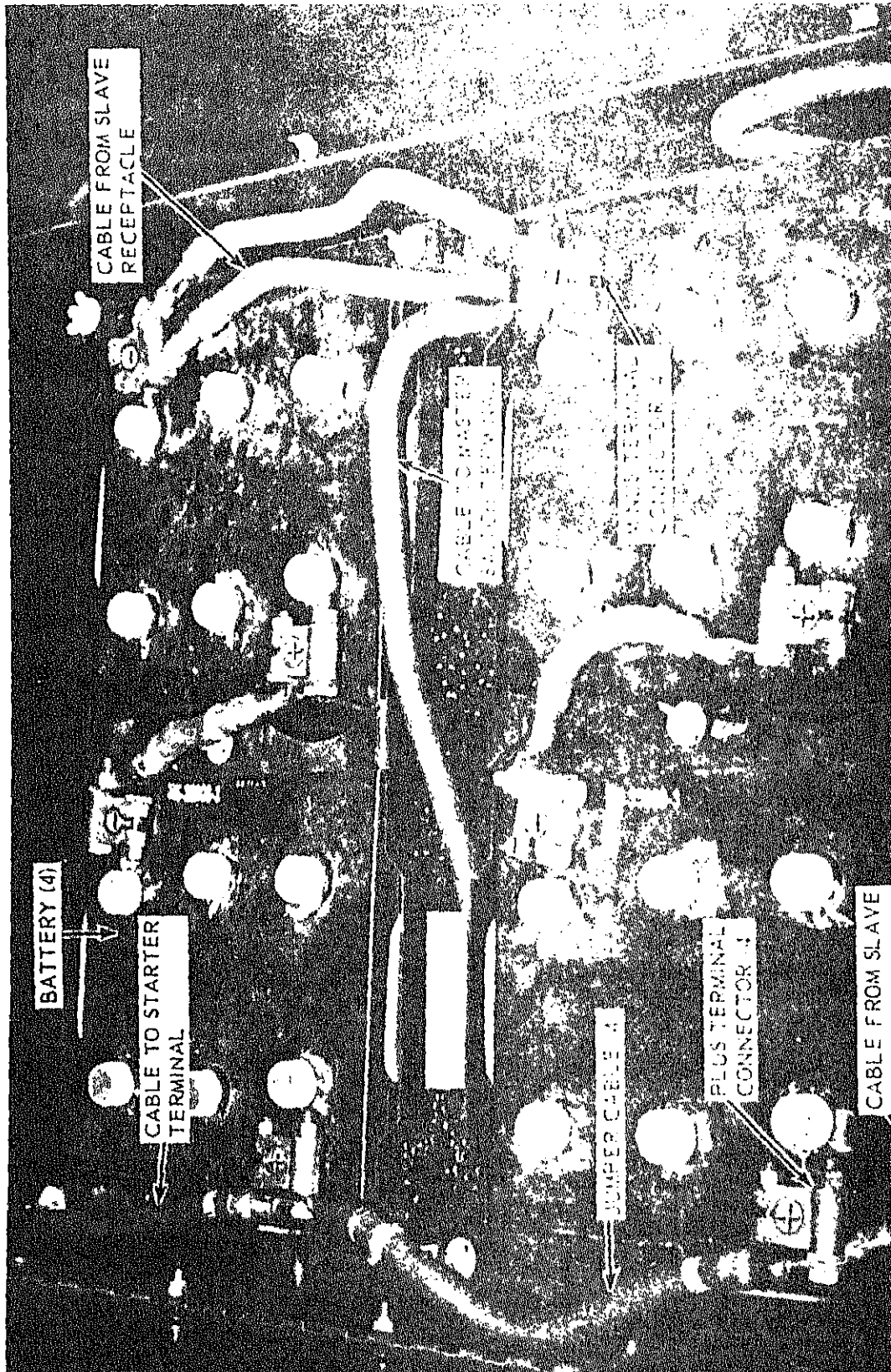
CABLE FROM SLAVE
RECEPTACLE

CABLE FROM SLAVE
RECEPTACLE

POWER CABLE 4

PLUS TERMINAL
CONNECTOR 4

CABLE FROM SLAVE



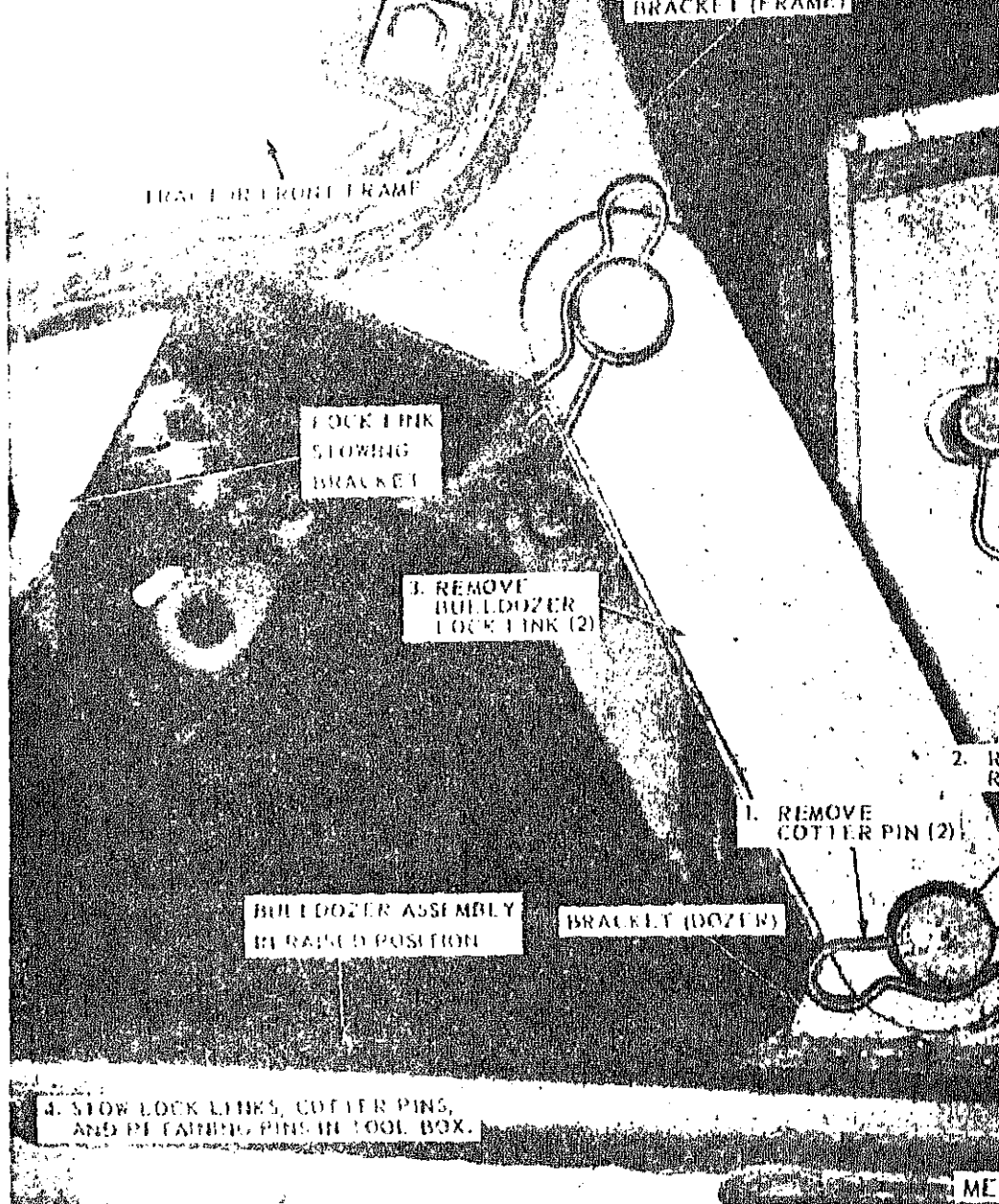
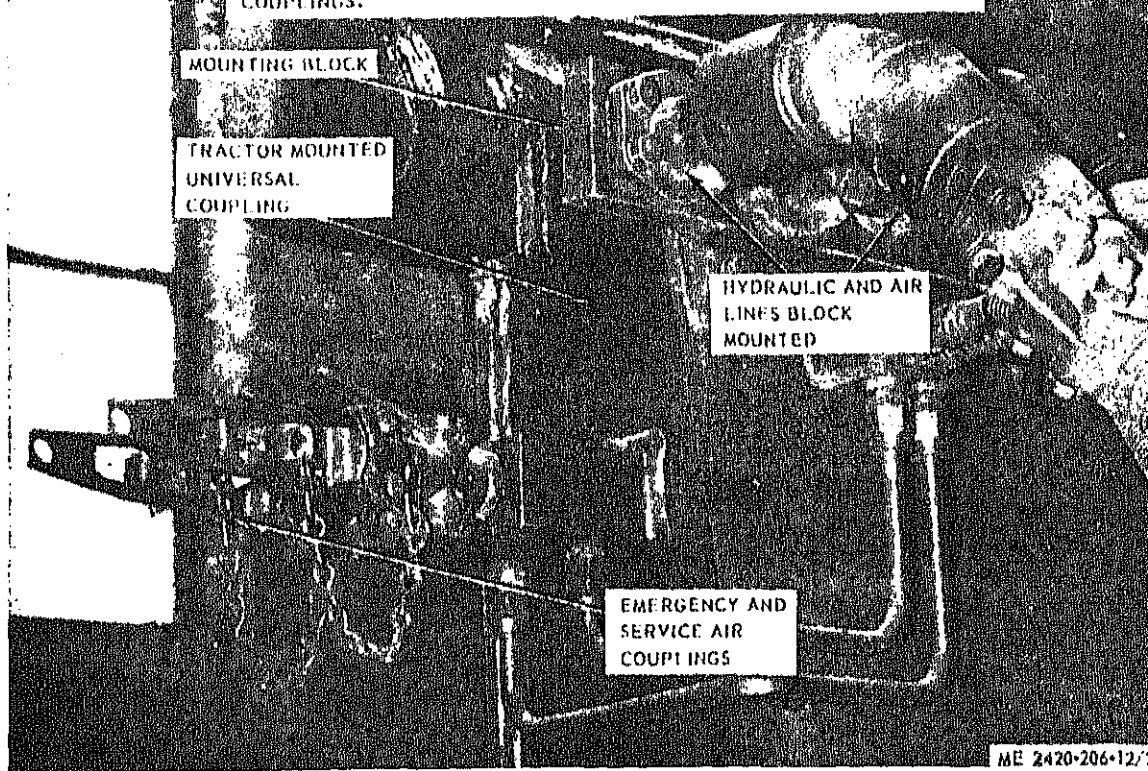
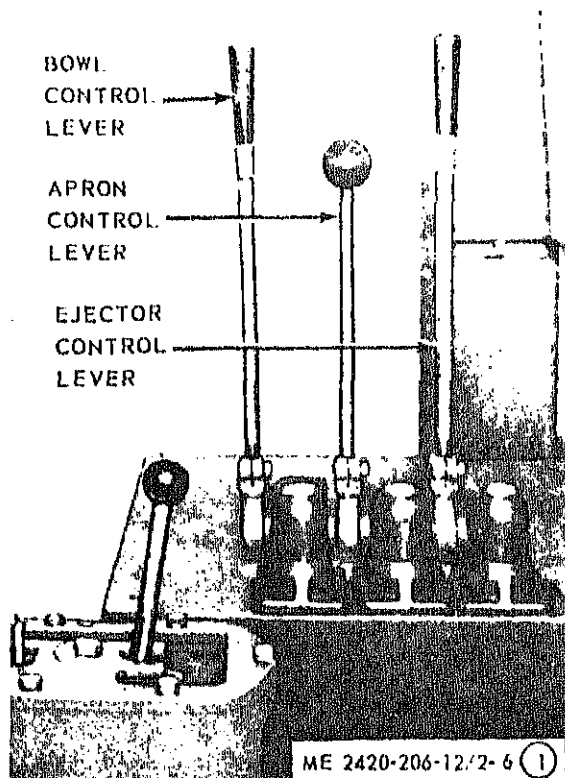


Figure 2-4. Bulldozer lock link, removal and installation.

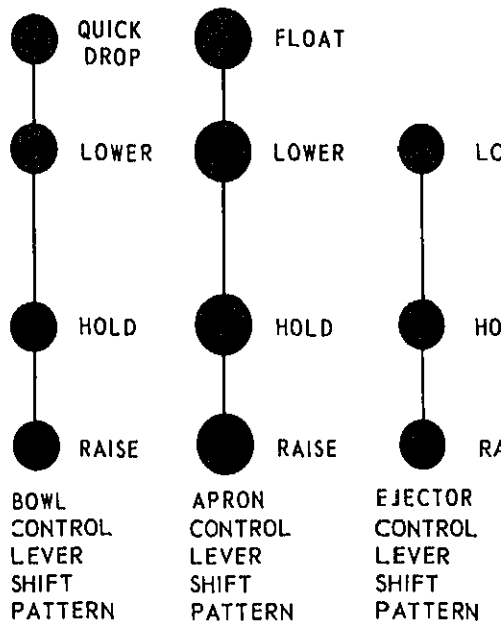


ME 2420-206-12/

Figure 2-5. Tractor universal coupler, hoses and lines.



ME 2420-206-12/2-6 ①



ME 2420-206-12/2

2-5. Dismantling for Movement

a. Dismantling tractor is not required for short-distance moves to a new worksite. Before crossing bridges with equipment, check bridge load tonnage. Refer to equipment tonnage, paragraph 1-4.

b. For movement to a new worksite within zone

of interior, prepare tractor as outlined in paragraph 2-1.

2-6. Reinstallation After Movement

Refer to paragraph 2-3 and service tractor before movement to a worksite within zone of the

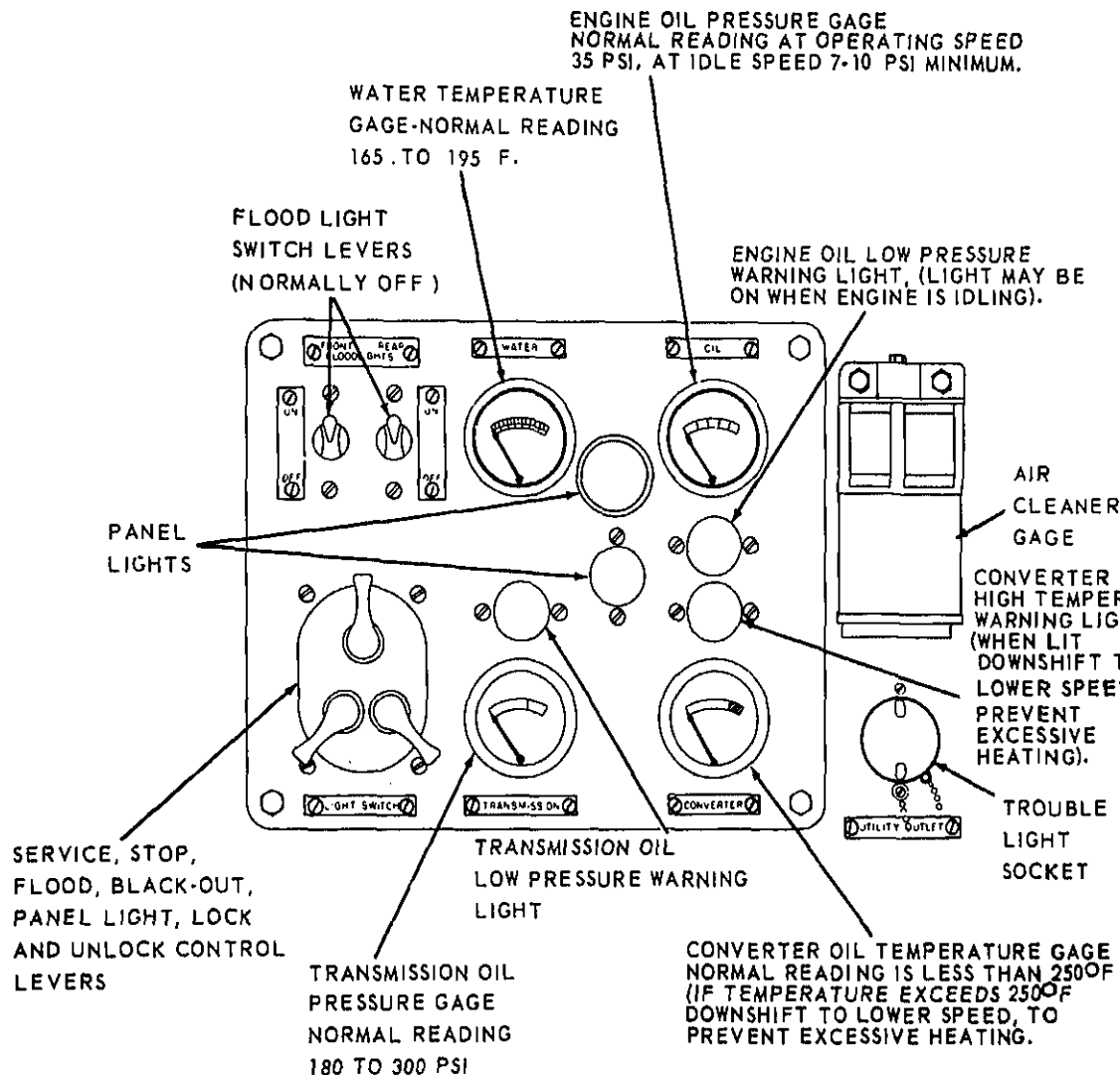
Section III. CONTROLS AND INSTRUMENTS

2-7. General

This section describes various controls and instruments and provides the operator/crew sufficient information to insure proper operation of the tractor and towed equipment (when attached).

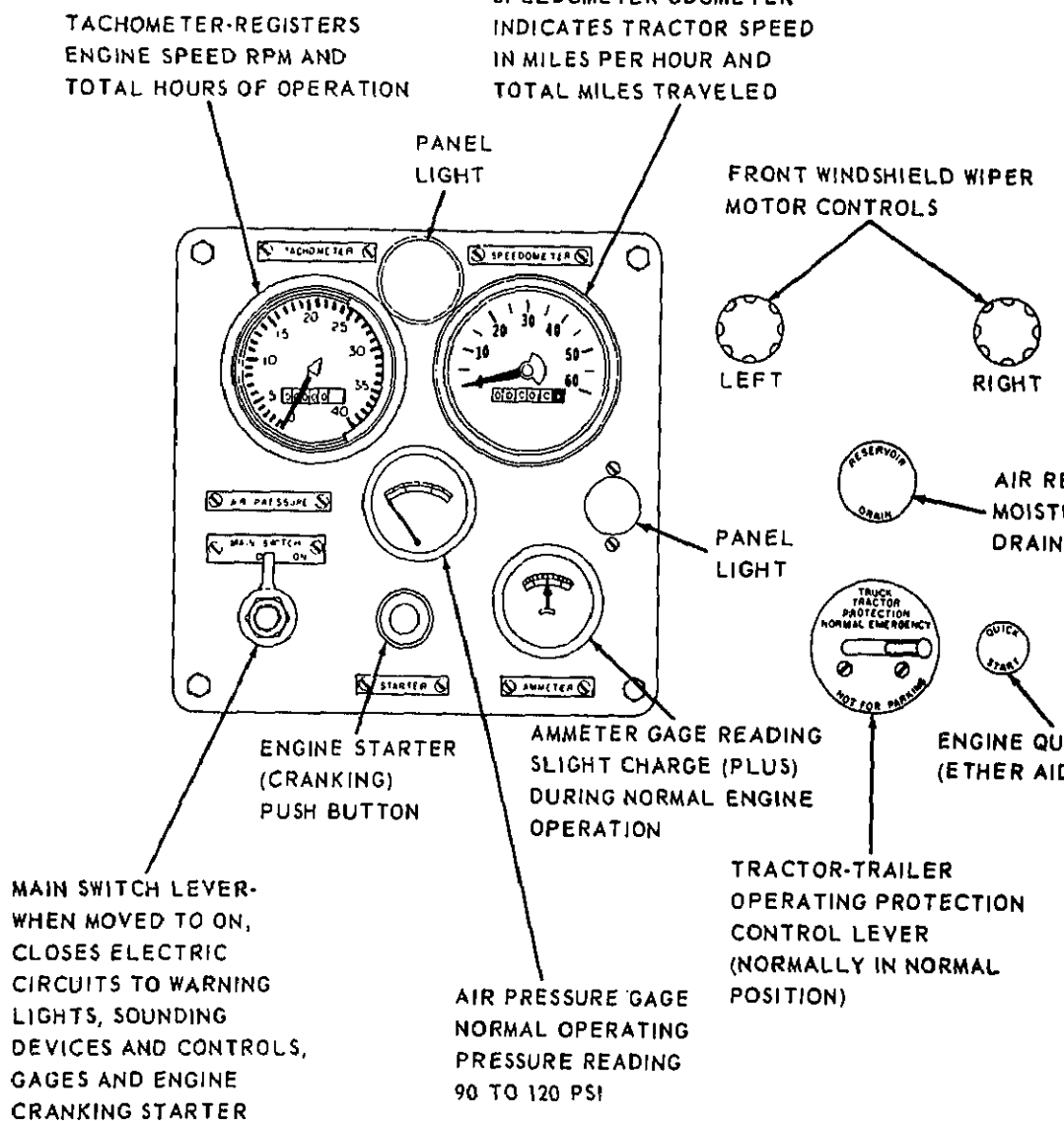
2-8. Controls and Instruments

The purpose of controls and instruments is to provide normal and maximum reading of gauges and instruments as illustrated in figure 2-7. Should abnormal readings occur, shut off engine immediately.



ME 2420-206-12.

Figure 2-7. Controls and instruments (sheet 1 of 6).



ME 2420-2

Figure 2-7. Controls and Instruments (sheet 2 of 6).

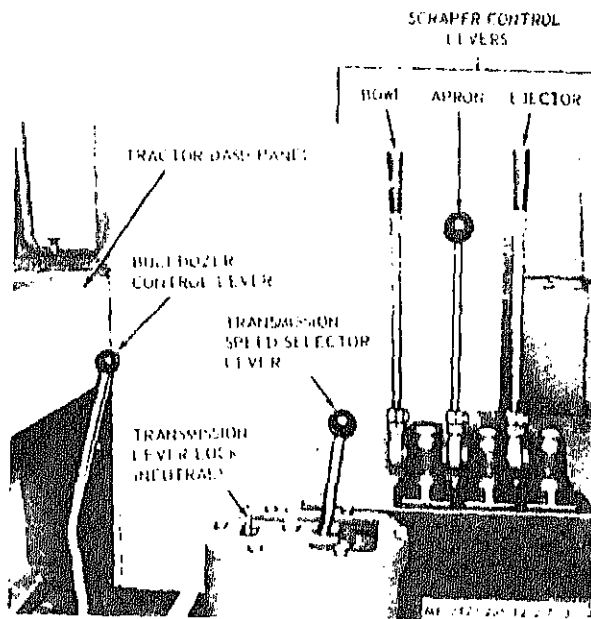
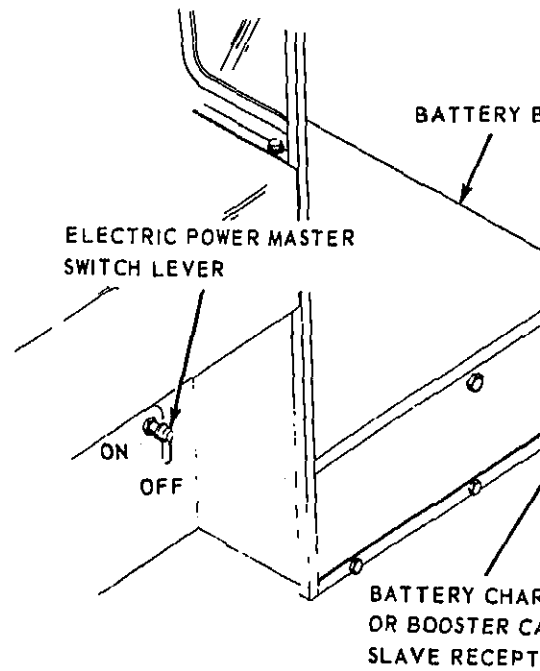
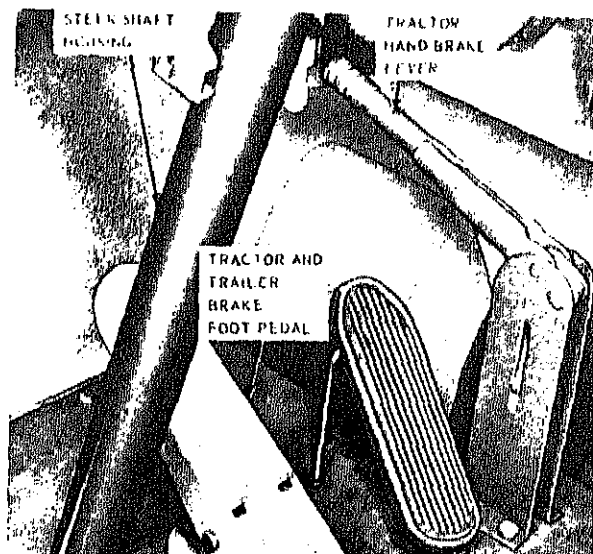


Figure 2-7. Controls and instruments (sheet 3 of 6).



ME 2420-206-12/

Figure 2-7. Controls and instruments (sheet 4 of 6).



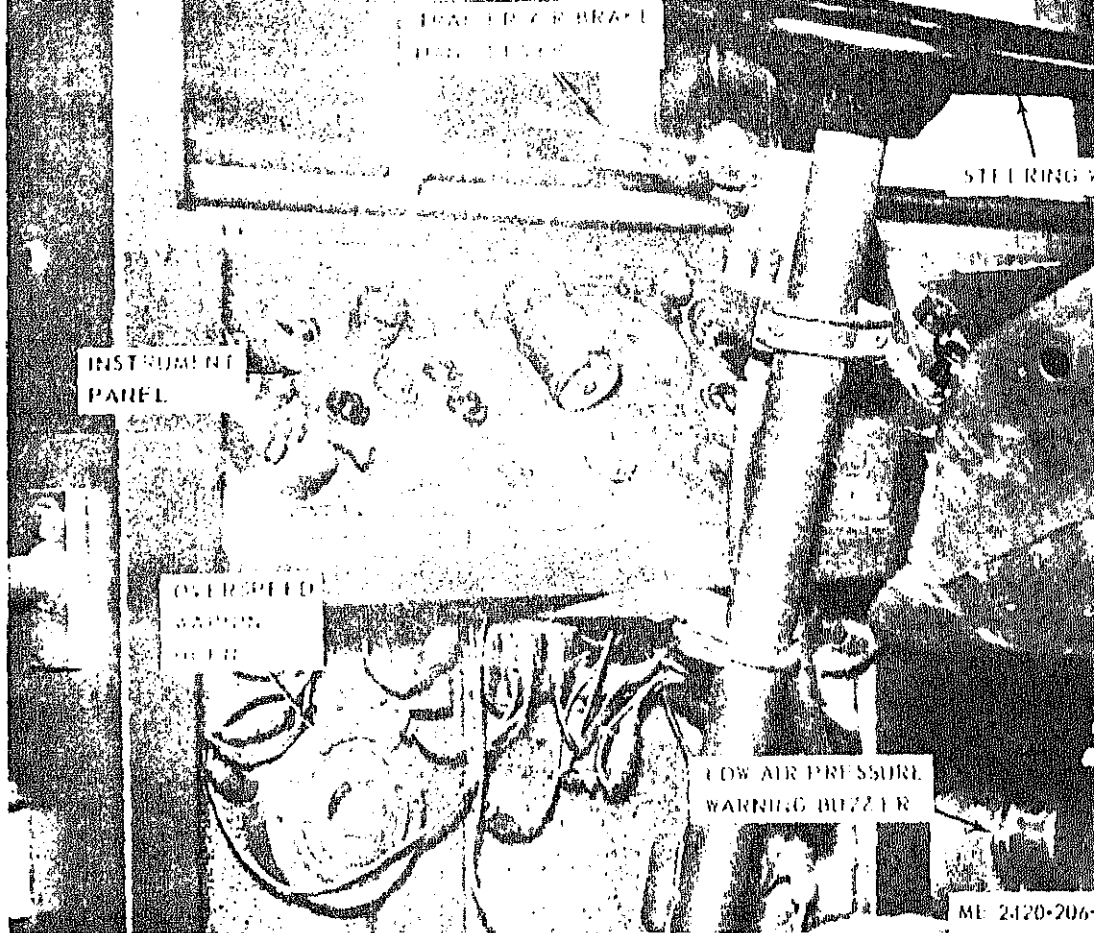


Figure 2-7. Controls and instruments (sheet 6 of 6).

Section IV. OPERATION UNDER USUAL CONDITIONS

2-9. General

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the tractor.

b. The operator must know how to perform every operation of which the tractor is capable. Instructions on starting and stopping tractor, operation of tractor, bulldozer and scraper (when towed) and on coordinating basic motions to per-

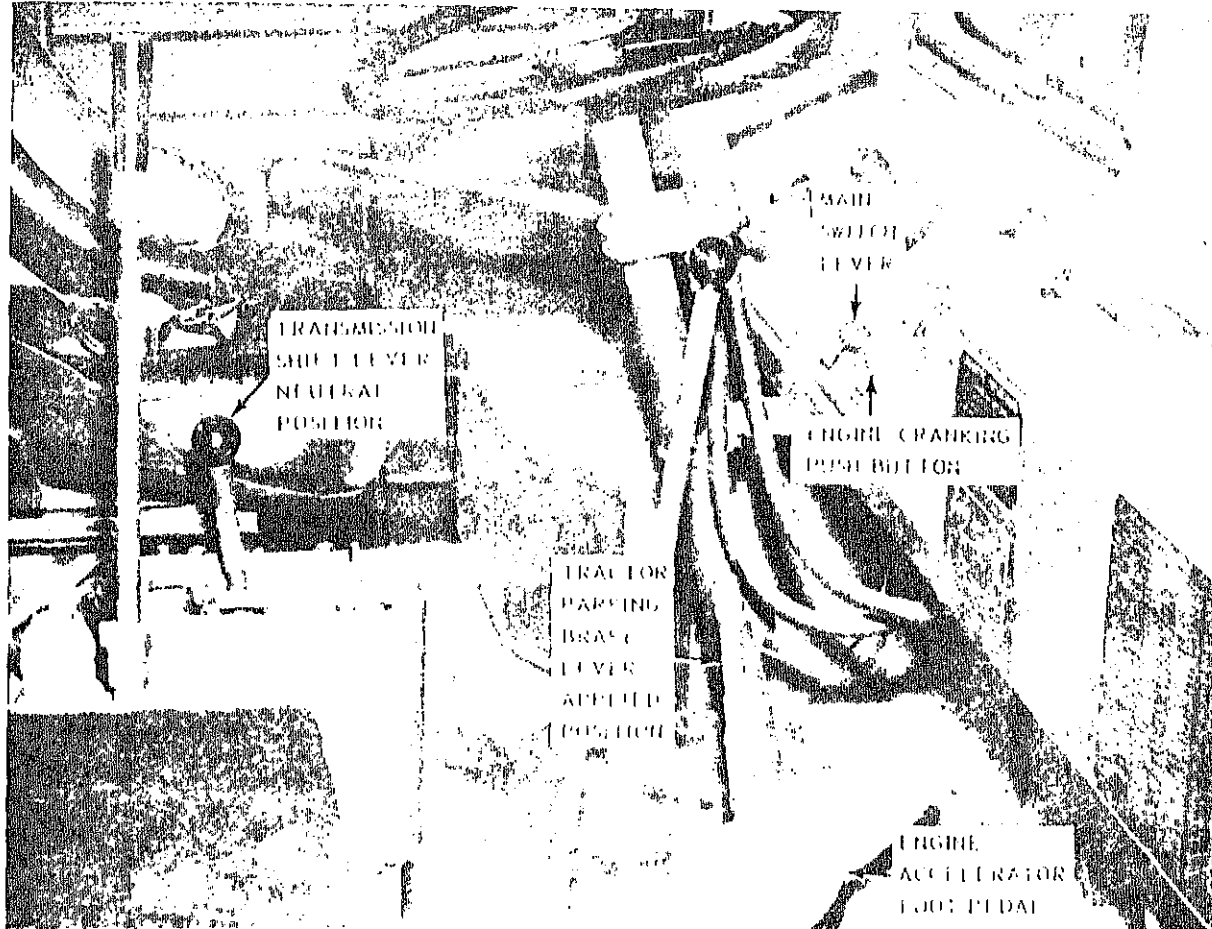
2-10. Starting

a. *Preparation for Starting.*

(1) Perform preventive maintenance and services, table 3-1.

(2) Lubricate as specified in maintenance order.

b. Start tractor in numerical step 1. If air pressure in air reservoir is less than 90 psi, air pressure warning buzzer (fig. 4



STEP 1. SET PARKING BRAKE LEVER IN APPLIED POSITION.

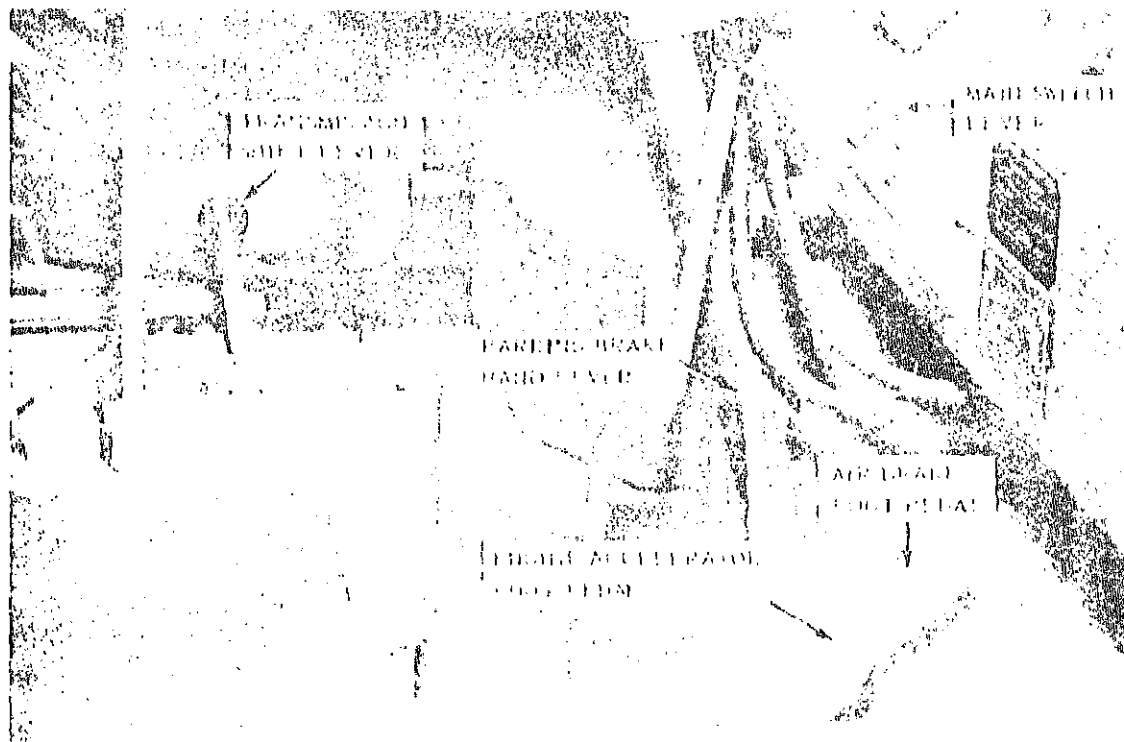
STEP 2. PLACE TRANSMISSION SHIFTER LEVER IN "NEUTRAL" POSITION.

STEP 3. MOVE MAIN SWITCH LEVER DOWN 27° TO "OFF".

STEP 4. DEPRESS ENGINE ACCELERATOR FOOT PEDAL HALFWAY TO FLOOR, MOVE MAIN SWITCH LEVER TO "ON" AND DEPRESS ENGINE CRANKING STARTING PUSH BUTTON UNTIL ENGINE STARTS.

CAUTION: DO NOT CRANK ENGINE MORE THAN 30 SECONDS CONTINUOUSLY, ALLOW 2 MINUTE INTERVALS BETWEEN STARTING ATTEMPTS. IF ENGINE FAILS TO START AFTER SEVERAL ATTEMPTS, STOP CRANKING AND DETERMINE CAUSE. CORRECT OR REPORT CONDITION TO DIRECT SUPPORT MAINTENANCE.

STEP 5. AFTER ENGINE STARTS, ACCELERATE TO 900 RPM (RACE ENGINE ROPS SMOOTHLY, OBSERVE GAGES (FIG. 2-7) FOR READINGS. SLOWLY RELEASE ROPS AND CHECK GAGES FOR NORMAL READINGS.



1. STOP TRANSMISSION LEVER TO STOP ENGINE AND TRANSMISSION.
2. STOP PARKING BRAKE HAND LEVER TO STOP ENGINE.
3. STOP AIR LEAD TO STOP ENGINE.
4. STOP FUEL LEVER TO STOP ENGINE.
5. STOP MAINT SWITCHE TO STOP ENGINE.

300 300

Figure 2-9. Tractor stopping instructions.

2-12. Operation of Equipment

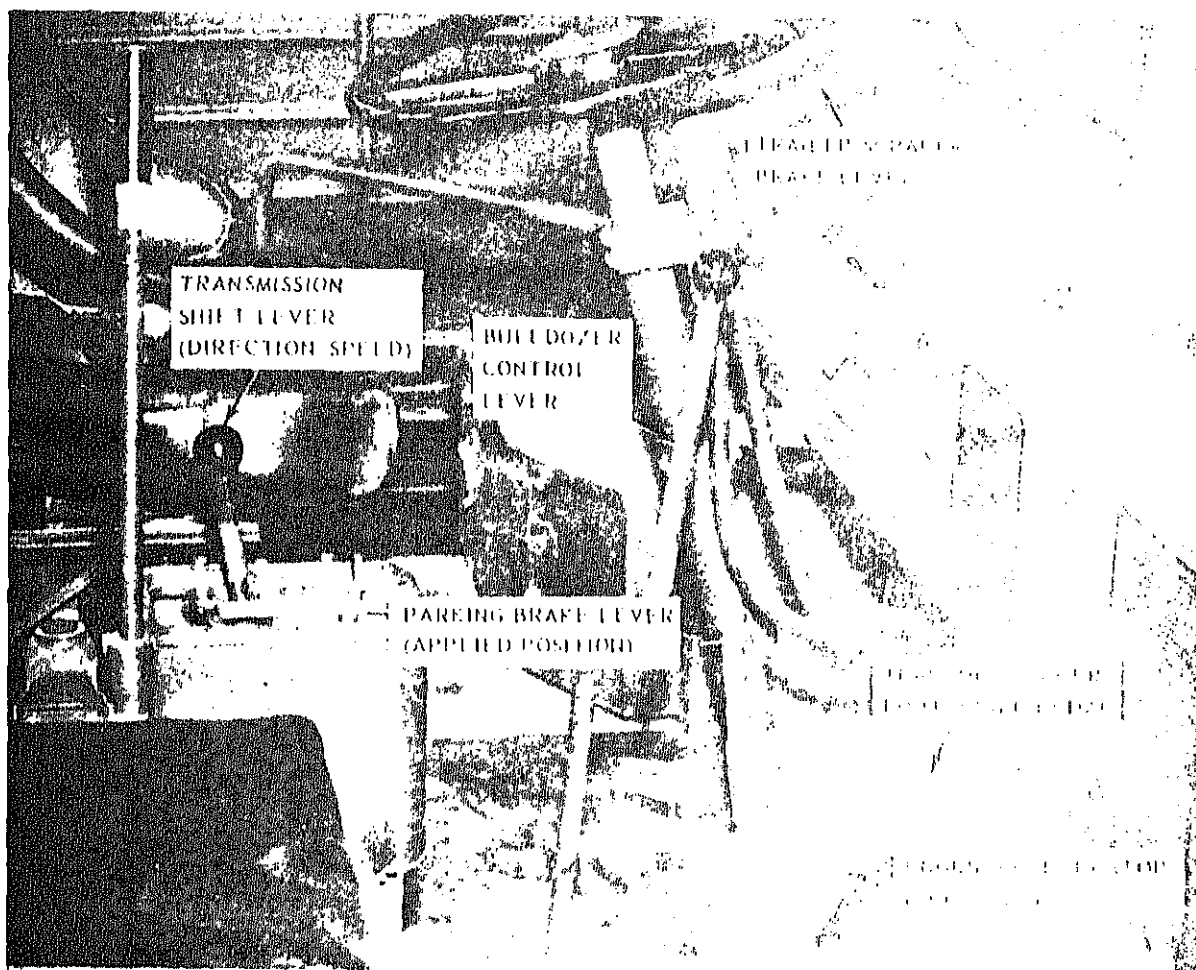
a. General. Tractor bulldozer assembly and scraper attachment is used for moving, hauling, leveling and grading of material.

b. Tractor Operation.

scraper yoke when making turns
turns as tractor can be steered into
causing damage to fuel or hydraulic

(2) Start tractor (para 2-10).

(3) Adjust operator seat and fan



STEP 1. START ENGINE (FIGURE 2-8)

STEP 2. RAISE BULLDOZER (FIGURE 2-11) (IF NECESSARY)

STEP 3. MOVE PARKING BRAKE LEVER FORWARD TO LOCK

STEP 4. POSITION TRANSMISSION SHIFT LEVER TO DESIRED DIRECTION AND SPEED.

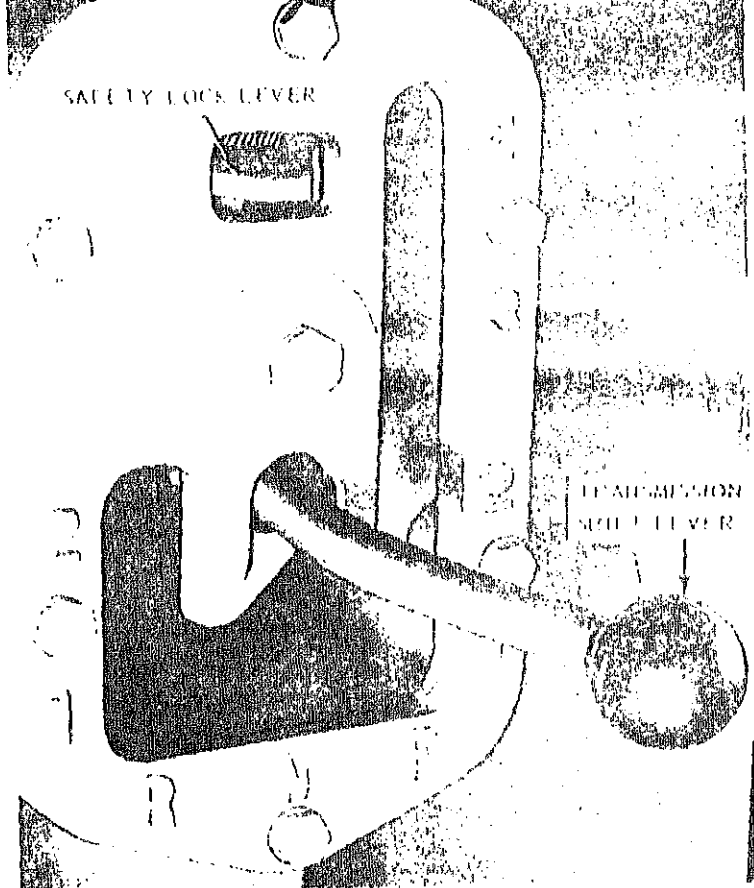
STEP 5. USE ACCELERATOR FOOT PEDAL TO CONTROL ENGINE SPEED.

STEP 6. USE BRAKE LEVER TO CONTROL TRACTOR-SCRAPER SPEED WHEN MOVING DOWN SLOPES.

STEP 7. USE FOOT BRAKE PEDAL TO SLOW DOWN AND STOP TRACTOR-SCRAPER.

CAUTION: ENGINE SPEED AND TRANSMISSION SPEED MUST BE CONTROLLED AND ADJUSTED TO PREVENT ENGINE SPEED EXCEEDING 2200 RPM. WHEN OVERSPEED WARNING HORN SOUNDS, APPLY BRAKE AND ADJUST TRANSMISSION SPEED TO CORRECT ENGINE OVERSPEED.

CAUTION: WHEN LOW AIR PRESSURE WARNING BUZZER SOUNDS, MOVE PROTECTION LEVER (FIGURE 2-12) TO "EMERGENCY". MOVE TRANSMISSION LEVER TO A LOWER SPEED POSITION AND ALLOW MACHINE TO ROLL TO A STOP.



TRANSMISSION SHIFT PATTERN

1. FOR BULLDOZING AND TRAILER SCRAPER OPERATION
SHIFT TO A SPEED RANGE AND ACCELERATE ENGINE
SPEED TO ASSUME THE LOAD. WHEN OVERSPEED WARNING
HORN SOUNDS APPLY BRAKES TO SLOW DOWN EQUIPMENT.
AS ENGINE SPEED REDUCES DOWNSHIFT ONE POSITION
AT A TIME.
2. FOR OVER THE ROAD TRAVEL MOVE SHIFT LEVER TO "F".
IF CONVERTER OIL TEMPERATURE RISES ABOVE NORMAL OR
ENGINE LABORS, DOWNSHIFT TO NEXT LOWER SPEED.
3. STOP EQUIPMENT BEFORE SHIFTING TO REVERSE
DIRECTION OF TRAVEL.
4. SHIFT TO "N" LOCKS SHIFT LEVER.
5. SHIFT TO "R-1" WHEN USING SCARIFIER

MF 2420-206-12-2-10 (2)

soft dirt or sand to help support the blade. Remove skid shoes when working on hard rocky ground or a stone quarry.

Note. The adjustable pitch strut for increasing or decreasing the pitch angle of the dozer blade is hand operated. It is mounted on the right side of the dozer assembly between the right push beam and the top of the dozer blade.

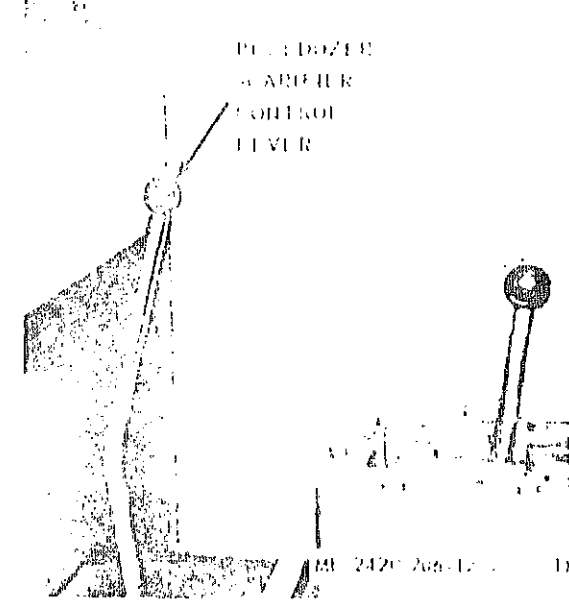
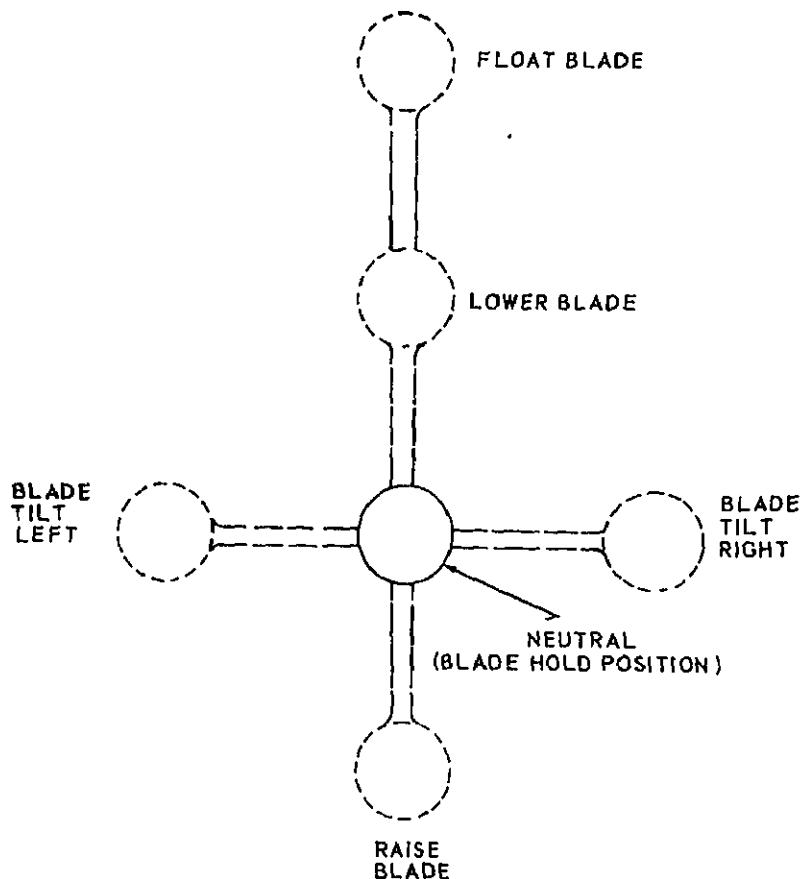


Figure 2-11. Bulldozer and scarifier operating instructions
(sheet 1 of 3).



NOTE: CONTROL LEVER AUTOMATICALLY SHIFTS TO NEUTRAL (HOLD) WHEN RELEASED (EXCEPT FLOAT).

1. TO MOVE MATERIAL AND CLEAR AREA OF SHRUBS, SMALL TREES AND BOULDERS, LOWER AND TILT BLADE TO DEPTH AND ANGLE DESIRED WHILE TRACTOR IS MOVING FORWARD (DO NOT RAM).
2. TO UPROOT LARGE TREES, RAISE BLADE TO HIGHEST LEVEL WHILE TRACTOR IS MOVING FORWARD (DO NOT RAM).
3. BEFORE GRADING AN AREA ATTACH SKID SHOES. LOWER AND TILT BLADE TO DESIRED POSITION WHILE TRACTOR IS MOVING FORWARD SHIFT LEVER TO FLOAT BLADE.

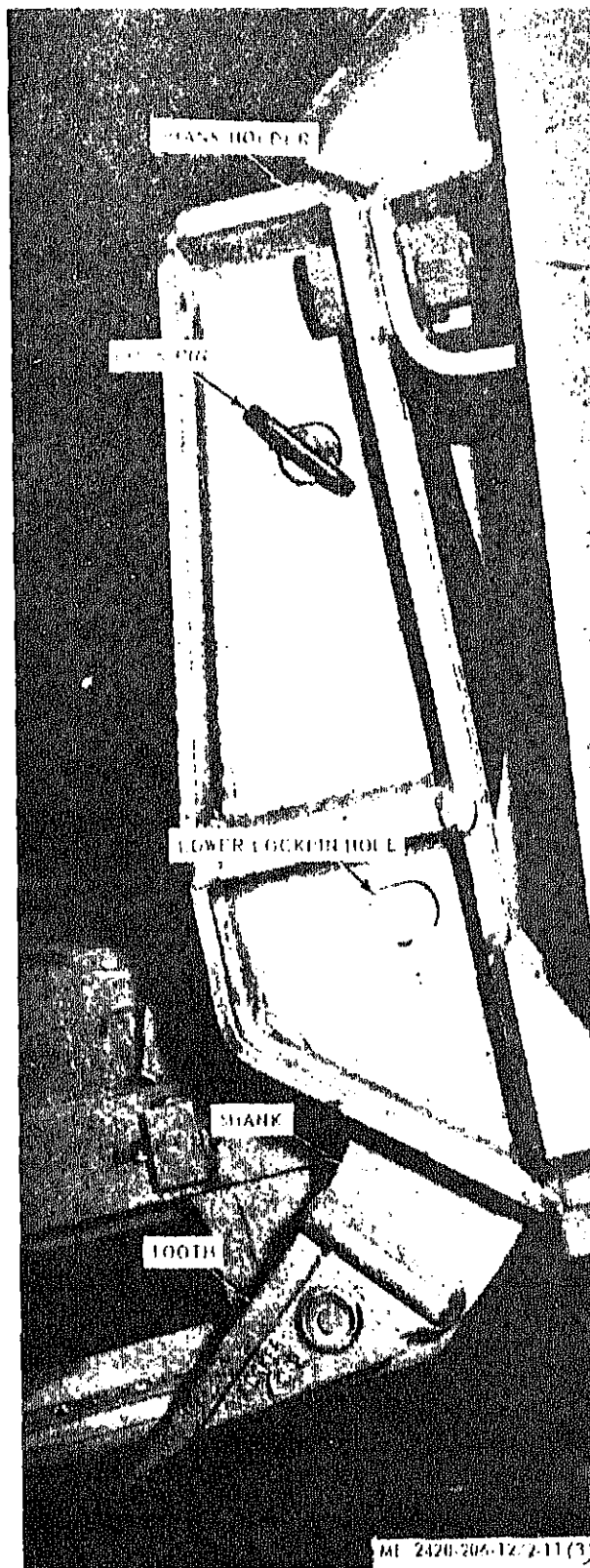
NOTE: SKID SHOES ARE USED FOR GRADING PURPOSES ONLY.

4. REMOVE LOCK PIN LOWER SHANK AND TOOTH AND SECURE WITH LOCK PIN IN LOWER LOCK PIN HOLE.

CAUTION: SUPPORT BLADE WHEN LOWERING OR RAISING SCARIFIER TEETH.

5. LOWER SCARIFIER TEETH (BLADE) TO DESIRED DEPTH AND TILT WHILE TRACTOR IS MOVING BACKWARD (REVERSE) RAISE TEETH (BLADE) WHEN MOVING TRACTOR FORWARD. REPEAT AS NECESSARY TO LOOSEN MATERIAL IN AREA. REFER TO 4 ABOVE AND SECURE TEETH IN RAISED POSITION. REFER TO 1 ABOVE AND MOVE MATERIAL.

ME 2420-206-12/2



- c. Correct coolant antifreeze solution for lowest temperature expected, TB-ORD-651. Drain corrosion resister (para 2-2) and remove element before inhibited antifreeze is used in coolant system.
- b. Inspect cooling system. Repair or report any leaks.
- c. Keep batteries fully charged. After adding water run engine for at least one hour.
- d. Keep fuel tank full when not in operation.
- e. Lubricate in accordance with current lubrication order.
- f. Allow engine to reach normal operating temperature before applying load.
- g. Drain moisture from air tanks by operating reservoir drain on instrument panel (fig. 2-7, sheet 2).
- h. Before stopping operation, see that equipment is positioned to prevent tires from freezing in mud and water.
- i. After operation do not apply parking brake. Put blocks under wheels to prevent tractor from rolling.

2-14. Operation in Extreme Heat

- a. Keep radiator filled to 2 inches below filler neck, repair or report coolant leaks.
- b. Keep battery electrolyte level to 3/8 inch above plates.
- c. Lubricate in accordance to current lubrication order.

2-15. Operation in Sandy or Dusty Areas

- a. Keep lubricant containers clean and covered when not in use.

Section VI. OPERATION OF AUXILIARY MATERIEL USED IN CONJUNCTION WITH EQUIPMENT

20. Fire Extinguisher (Dry Chemical Type)

a. Description and Operation.

- (1) The 2 1/2 pound fire extinguisher is charged with dry chemicals under pressure and is effective in extinguishing all types of fires starting and confined in small areas of equipment and in cold weather temperatures to -25 F. (-31 C.). When extinguisher is winterized for extreme cold temperatures (nitrogen) fires can be extinguished in temperatures below -25 F. (-31 C.).
- (2) Remove fire extinguisher from equipment, handle, press lever, use.

direct powered spray at base of flames.

b. Maintenance.

- (1) When pressure indicator reading is below 125 psi, seal is broken or weight is less than pounds, replace extinguisher.
- (2) Replace used fire extinguishers immediately.

2-21. Engine Starting Aid

- a. A starting aid cylinder (fig. 2-12) contains ether under pressure.

tion order.

- d. Service engine crankcase, transmission system, and hydraulic system breathers as necessary.

- e. Service fuel filters, hydraulic oil filters, engine oil filters daily or as necessary.

- f. Service air cleaner as indicated by sensor on dash panel.

2-16. Operation Under Rainy or Humid Conditions

- a. Keep fuel tanks full at all times.
- b. Release moisture from air system frequently.
- c. Remove moisture from batteries and keep wiring dry.
- d. Keep exposed finished parts and parts lubricated.

2-17. Operation in Salt Water Area

- a. After operation, wash tractor with fresh water when available.
- b. Dry all exposed wiring terminals, batteries, cables.
- c. Lubricate in accordance to current lubrication order.

2-18. Operation in Mud or Deep Water

- a. Clean equipment with fresh water when available after operation.
- b. Dry exposed wiring terminals, batteries, cable.

2-19. Operation in High Altitudes

Refer to DS maintenance when tractor is operated at higher altitudes.

e in cold weather temperatures, below 32°F.
(). The cylinder and valve is mounted inside
n lower right side.

When starter switch is depressed (fig. 2-7)
engine is cranking, pull out quick start knob
or 2 seconds, then push knob in.

Note. Do not use quick start knob when engine is oper-
r before cranking has started.

Warning: Ether is highly explosive. Do not
heat to cylinder, or store cylinders where
may become excessive; do not throw empty
cylinders in an open fire. Cylinder can explode
cause death or serious injury to personnel.

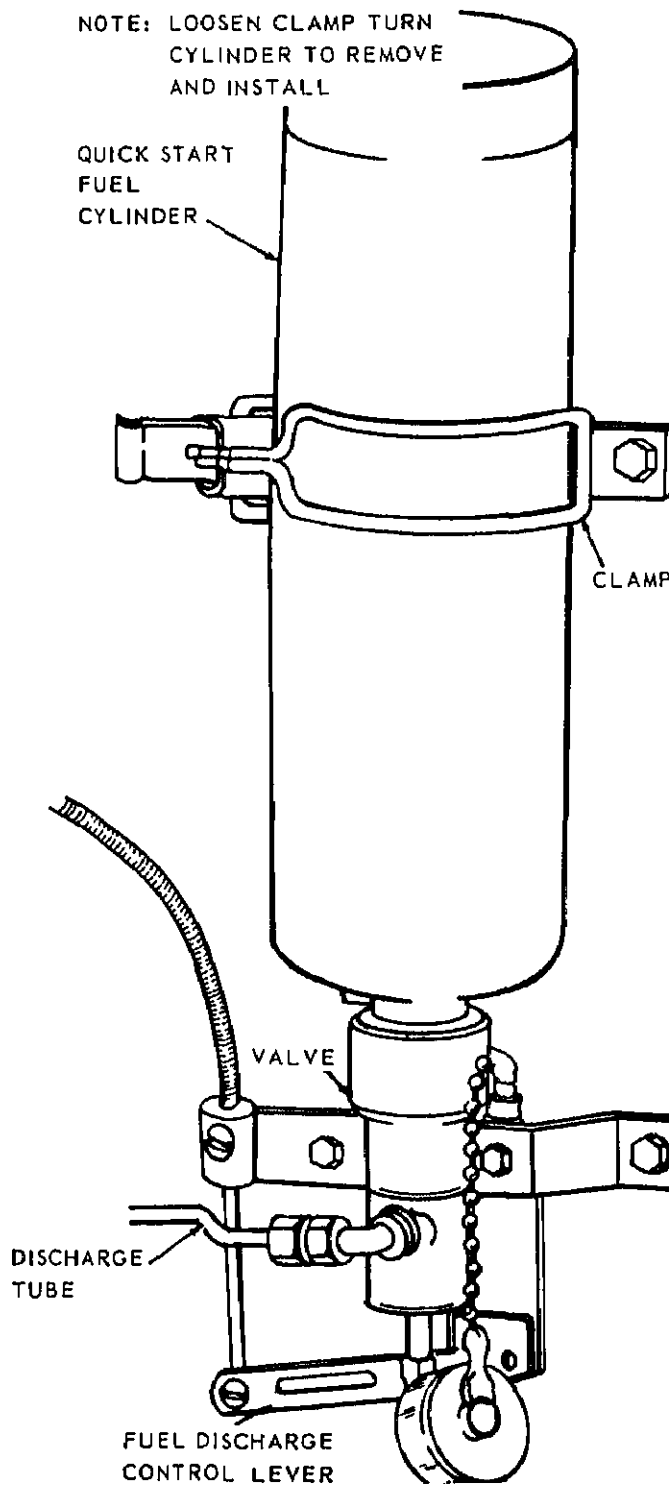
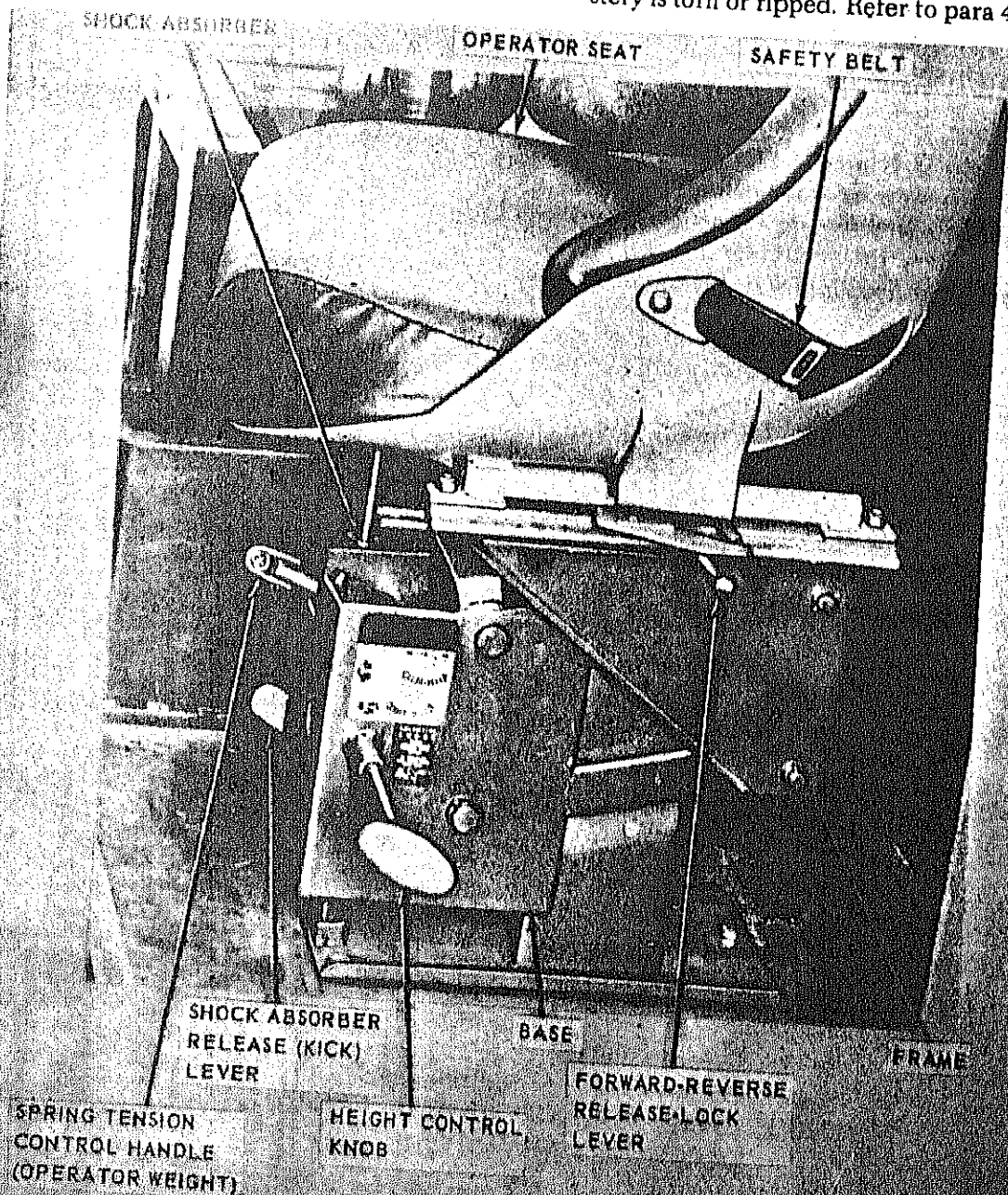


Figure 2-12. Engine starting aid.

a. Operator shall check all safety belt attachments before starting and operating the equipment.

b. Operator seat adjustment is illustrated in figure 2-13.

c. Repair or replace seat cushions when the upholstery is torn or ripped. Refer to para 4-62.



- STEP 1: WITH OPERATOR SEATED, RELEASE SHOCK ABSORBER AND ADJUST SPRING TENSION FOR 2 INCH (MIN) CLEARANCE BETWEEN TOP OF BASE AND BOTTOM OF FRAME.
- STEP 2: CONTROL HEIGHT POSITION AND FORWARD-REVERSE POSITION AS DESIRED WITH KNOB AND LEVER.

NOTE: SHOCK ABSORBER IS POSITIONED FOR USE AUTOMATICALLY WHEN NECESSARY.

ts cannot be corrected.

Tractor Engine Emergency Starting

General. When a replacement starter or battery cable is not available, the engine may be started by towing or pushing the tractor.

Precaution: To prevent damage to push start engine when towing or pushing tractor backward while engine is stopped, remove propeller shafts to rear axles.

Starting by Towing or Pushing.

(fig 2-14) *General.* When the engine is started by towing or pushing, the tractor should be moved at a slow speed (1 to 2 mph) until the engine is running. The pressure of the accelerator pedal should be increased gradually until the tractor is moving at a speed of 1 to 2 mph. The accelerator lever should be moved to the "idle" position when the tractor is stopped. The engine should be allowed to run for 5 to 10 minutes before the tractor is driven at a speed of 700 to 750 rpm.

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS**Section I. OPERATOR'S AND ORGANIZATIONAL MAINTENANCE
REPAIR PARTS, TOOLS AND EQUIPMENT****3-1. Tools and Equipment**

No special tools or equipment are required by operator and organizational maintenance personnel for maintenance of tractor.

**3-2. Organizational Maintenance
Repair Parts**

Organizational maintenance repair parts are in TM 5-2420-206-20P.

Section II. LUBRICATION**3-3. General Lubrication Information**

This section contains lubrication instructions which are supplemental to, and not specifically covered in the lubrication order. For current lubrication order, refer to DA Pam 310-4.

3-4. Detailed Lubrication Information

a. Care of Lubricants. Keep all lubrication containers in a clean, dry place away from heat. Allow no dust, dirt, or other foreign material to mix with lubricants in containers. Keep all equipment clean and ready for use.

b. Cleaning. Keep external components of the tractor free of lubricants that are splashed, spilled, or dropped on the equipment. Wipe all lubricating points before and after lubricating.

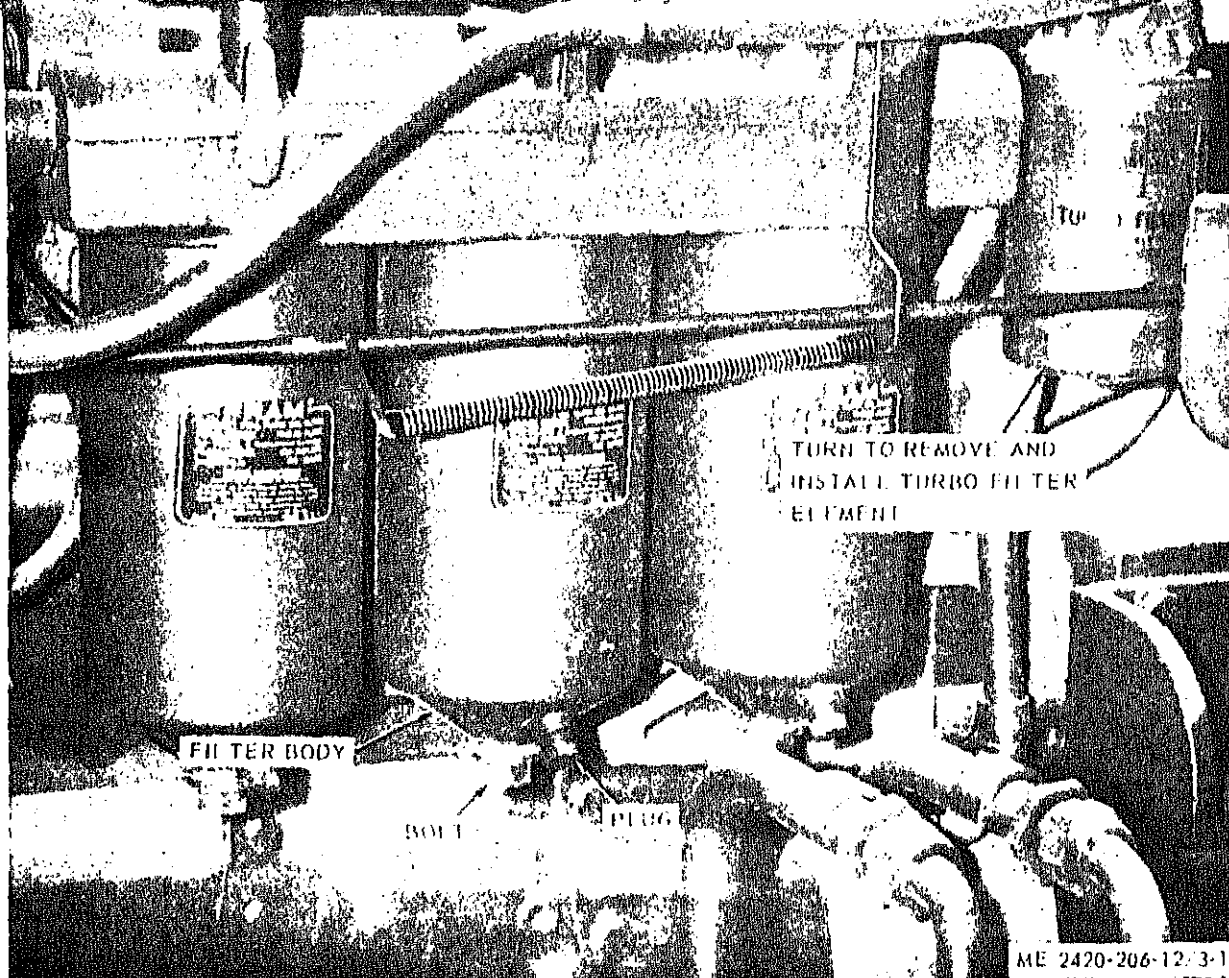
c. Points of Lubrication. Service lubrication points at proper intervals as indicated on LO 5-2420-206-12.

d. Turbocharger Lubrication. Filtered crankcase oil lubricates turbocharger turbine. During dusty, hot weather operating conditions, check engine crankcase oil level frequently and change turbocharger oil filter more frequently than usual in accordance with current lubrication order.

e. Transmission Oil Level. Check transmission oil level with engine operating at idle speed. Check transmission at operating temperature.

3-5. Engine Oil System Service

a. Filters. Service engine oil system filters as illustrated in figure 3-1. After servicing, start engine and check filters for leaks. Wait 30 minutes, then check if engine oil level is up to full mark on dipstick. Check gages for proper pressure (2-71).

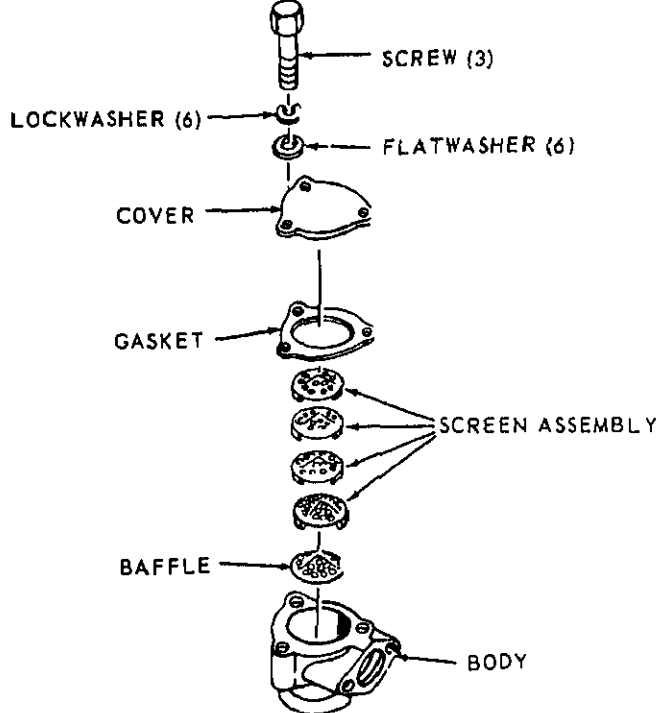


1. REMOVE PLUG, DRAIN OIL FROM FILTER BODY.
 2. REMOVE BOLT, FILTER BODY, FILTER ELEMENT AND GASKETS, CLEAN FILTER BODY.
 3. INSTALL NEW FILTER ELEMENT AND GASKETS, INSTALL FILTER BODY, BOLT AND PLUG.
- NOTE REMOVE AND INSTALL OTHER FILTER ELEMENTS IN A SIMILAR MANNER.
4. REMOVE DIRTY TURBO FILTER ELEMENT, INSTALL NEW FILTER ELEMENT. CORRECT OPERATIONAL LEAKS AS NECESSARY.

Figure 3-1. Engine oil system filter service.

b. Engine Crankcase Breather. Service engine crankcase breather as illustrated in figure 3-2.

Under conditions of extreme dust, clean the engine crankcase breather daily.



- STEP 1. REMOVE SCREWS, LOCKWASHERS, FLATWASHERS, COVER, GASKET, SCREEN ASSEMBLY AND BAFFLE FROM BODY.
- STEP 2. CLEAN METAL PARTS WITH SOLVENT, DRY THOROUGHLY.
- STEP 3. REPLACE GASKETS AND DEFECTIVE ITEMS.
- STEP 4. INSTALL IN REVERSE ORDER OF REMOVAL.

ME 2420-206-12/3-2

Figure 3-2. Engine crankcase breather service.

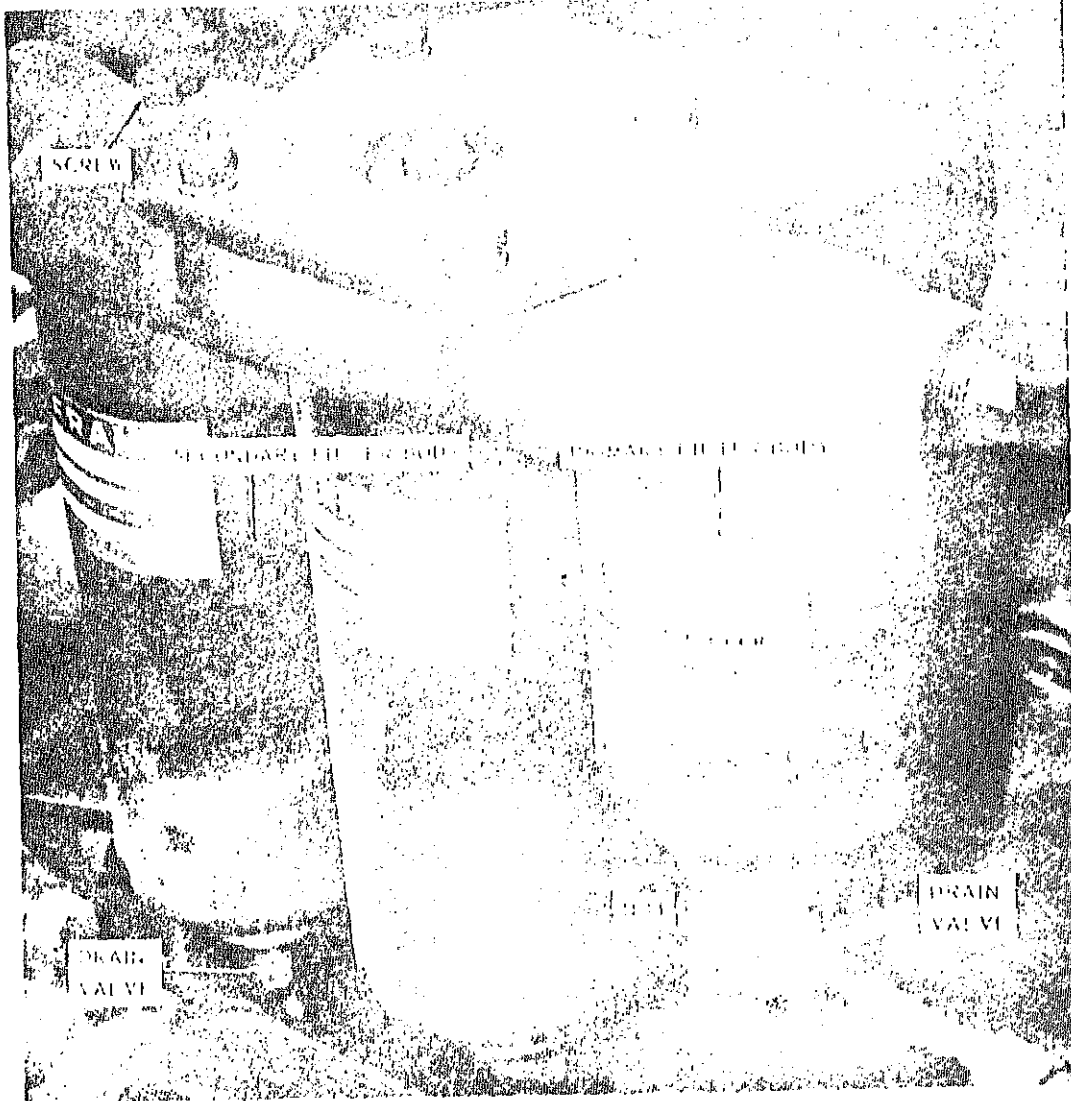
3-6. Fuel System Service

a. Filters. Service fuel filters as illustrated in figure 3-3. Inspect for leaks.

b. Fuel Tank Strainer Service. Service fuel tank

strainer as illustrated in figure 3-4.

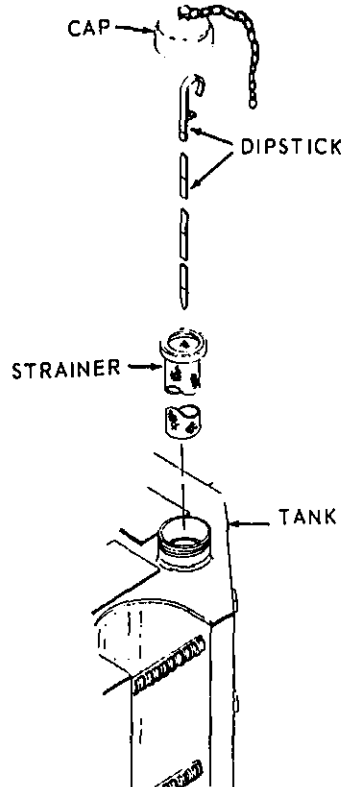
c. Engine starting aid. Service starting aid as illustrated in figure 2-12.



1. DRAIN FUEL SEDIMENT.
 2. REMOVE SCREW SECONDARY FILTER BODY, LABEL IT AND SET ASIDE.
 3. CLEAN FILTER BODY.
 4. INSTALL NEW FILTER AND WASH IT. INSTALL SCREW AND TIGHTEN. CLOSE DRAIN VALVE.
- NOTE: REMOVE AND DISCARD FILTERS AS THEY BECOME CLOGGED.
5. REMOVE NUT AND PRIMARY FILTER BODY, REMOVE FILTER ELEMENT.
 6. CLEAN FILTER BODY, CLEAN FILTER ELEMENT. WASH AND DISCARD FILTERS.
 7. INSTALL ELEMENT, BODY AND NUT. CLOSE DRAIN VALVE.

MS 2420 A/W 12-3-3

Figure 3-3. Fuel filter service.



STEP 1. REMOVE CAP, DIPSTICK AND STRAINER FROM TANK.

STEP 2. CLEAN STRAINER WITH SOLVENT AND DRY THOROUGHLY.

STEP 3. INSTALL IN REVERSE ORDER OF REMOVAL.

ME 2420-206-12/3-4

Figure 3-4. Fuel tank strainer service.

3-7. Transmission and Torque Converter and Hydraulic Oil System Service

a. Transmission and Torque Converter Service.

(1) Draining.

(a) Drain transmission and torque converter every 500 operating hours. Operate tractor until temperature of 180° to 200° F. is indicated on converter oil temperature gage (fig. 2-7).

(b) Provide containers large enough to catch 18 gallons of oil used in system. Remove drain plugs from bottoms of torque converter and transmission.

(c) Check first oil emitted for metallic particles that indicate internal transmission damage.

(e) Service filter as illustrated in figure 3-5.

(f) Remove six capscrews, flat washers, and lockwashers securing rear rock guard. Remove capscrews and lockwashers that secure oil pan to bottom of transmission; remove oil pan. Thoroughly clean screen exposed when oil pan is removed. Remove, clean, and install two magnets.

(g) Install oil pan using new gaskets.

(2) Filling.

(a) Fill transmission, refer to current manual for proper transmission fluid.

(b) Remove fill plug from top right of torque converter and fill transmission and torque converter hydraulic system.

time transmission and torque converter lines.

(e) With engine running at 700 to 750 rpm, add transmission fluid to bring the level to the full mark on dipstick. Operate until a temperature of 180 ° to 200 ° F. is indicated on converter oil temperature gage; recheck level and add fluid if necessary.

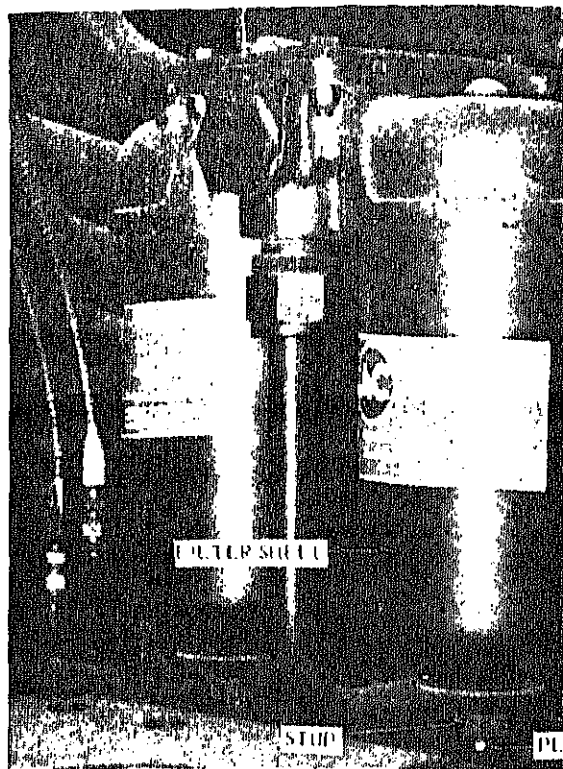
b. *Hydraulic Oil Tank Element and Strainer.* Service element and strainer as illustrated in figure 3-6.

-8. Air Cleaner Filter Service

a. *Service Indicator.* Air cleaner service indicator on dash panel will show red when filter service is necessary. Push plunger under indicator to reset.

b. *Filter.* Service air filter as illustrated in figure 3-7.

Caution: Do not attempt to clean and reuse dirty filter element. Cleaning can rupture filter elements permitting dirt particles to enter engine. Do not use if dropped. Use extreme care when installing element.

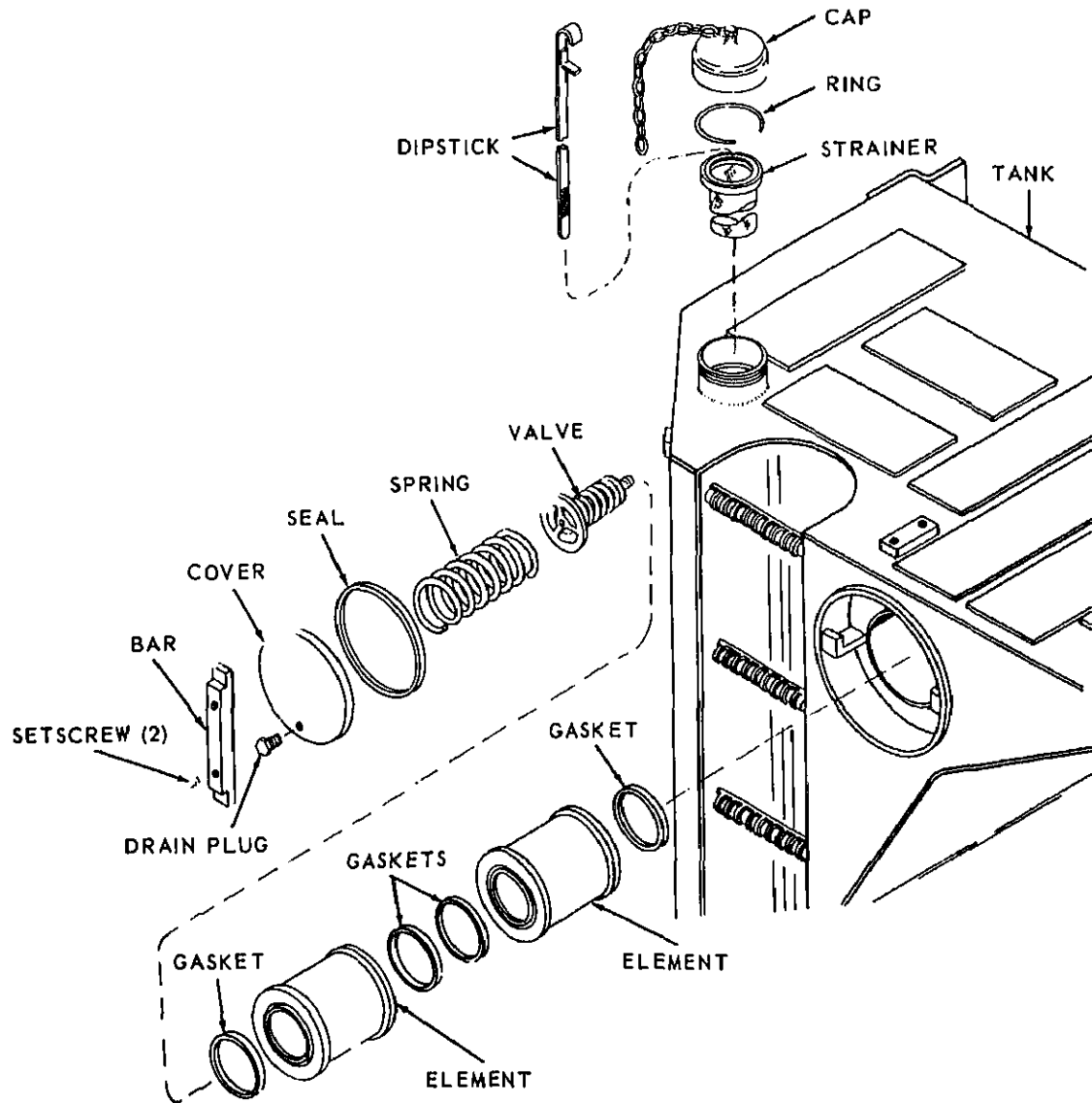


1. REMOVE PLUG, DRAIN OIL FROM SHELL.
2. REMOVE STUD, FILTER SHELL, FILTER AND GASKETS, CLEAN SHELL.
3. INSTALL NEW FILTER ELEMENT AND GASKETS, INSTALL FILTER SHELL, STUD AND PLUG.

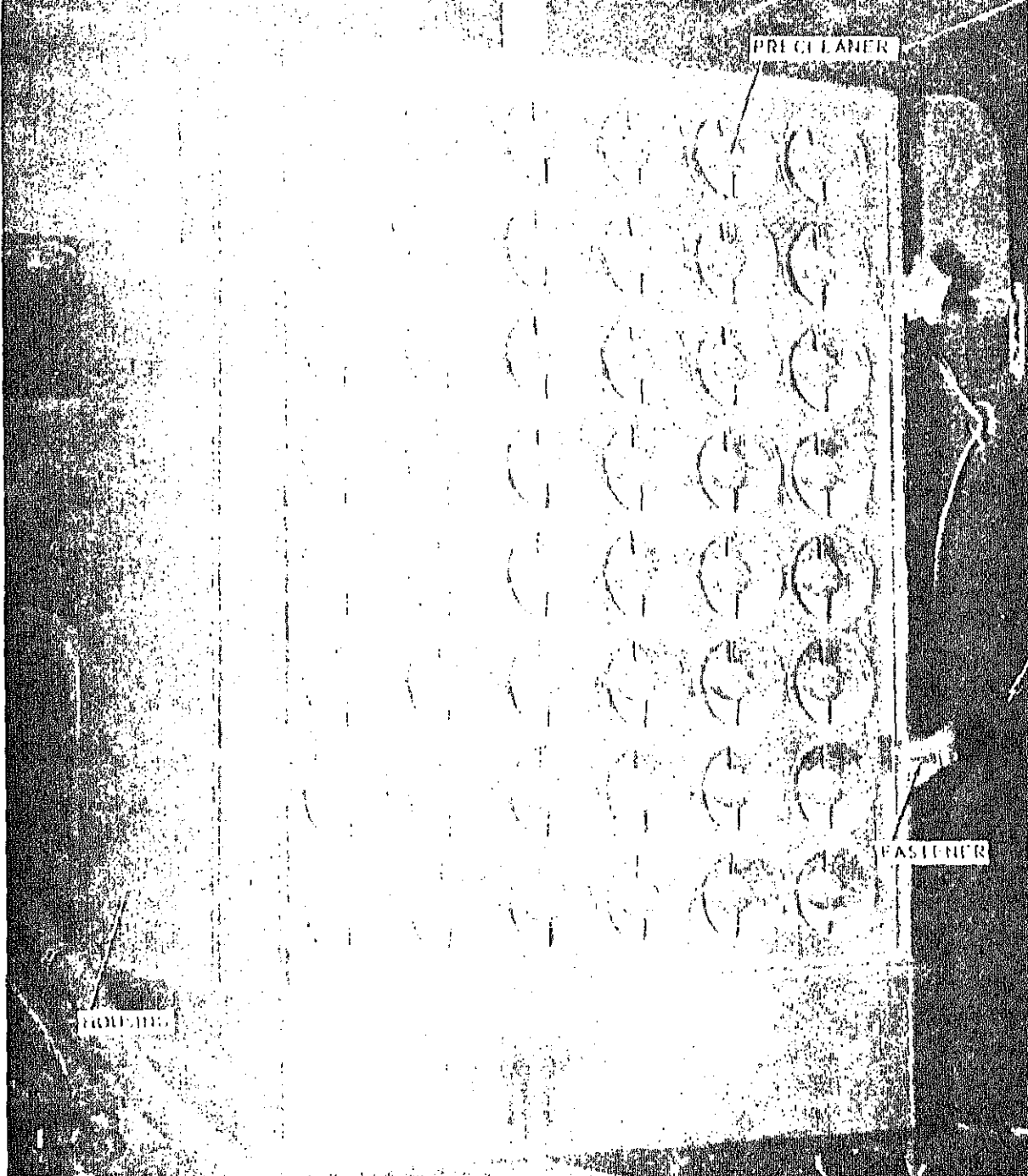
NOTE. REMOVE AND INSTALL OTHER FILTER ELEMENT IN A SIMILAR MANNER.

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Figure 3-5. Transmission and torque converter, oil filter s



- STEP 1. REMOVE CAP, DIPSTICK, RING AND STRAINER FROM TANK.
- STEP 2. CLEAN AND DRY STRAINER. REPLACE DAMAGED STRAINER AND INSTALL IN REVERSE ORDER OF REMOVAL.
- STEP 3. REMOVE DRAIN PLUG FROM COVER AND ALLOW OIL TO DRAIN FROM ELEMENT HOUSING.
- STEP 4. LOOSEN SETSCREWS AND REMOVE BAR, COVER, SEAL, SPRING, VALVE, GASKETS AND ELEMENTS FROM TANK HOUSING.
- STEP 5. CLEAN TANK ELEMENT HOUSING. REPLACE GASKETS, ELEMENTS, AND DEFECTIVE SPRING, SEAL AND VALVE. INSTALL PARTS IN REVERSE ORDER REMOVAL. FILL TANK (SEE LO).



1. RELEASE VENTS, REMOVE PRECLEANER AND FILTER.
2. CLEAN OUT INSIDE OF AIR DAMPERED CLEAN CLOTH.
3. CLEAN PRECLEANER, RELEASE AIR PRESSURE AND CLOTH.
4. REWASH REWASH, REINSTALL PRECLEANER AND SECURE WITH FASTENERS.

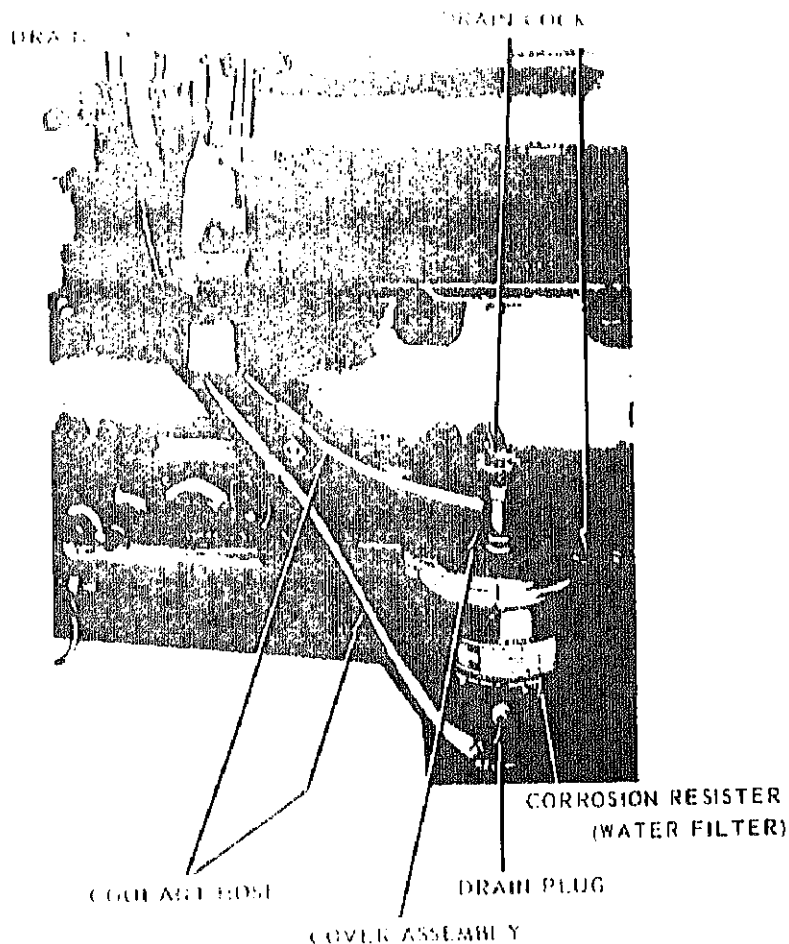
ME 2420-206-12 3-7

Figure 3-7. Air cleaner filter service.

3-9. Water Filter Service (Corrosion Resister)

Service water filter as illustrated in figure 3-8. Install new gasket.

CAUTION: NEVER OPERATE THE COOLING SYSTEM WHEN A CORROSION RESISTER ELEMENT IS INSTALLED.

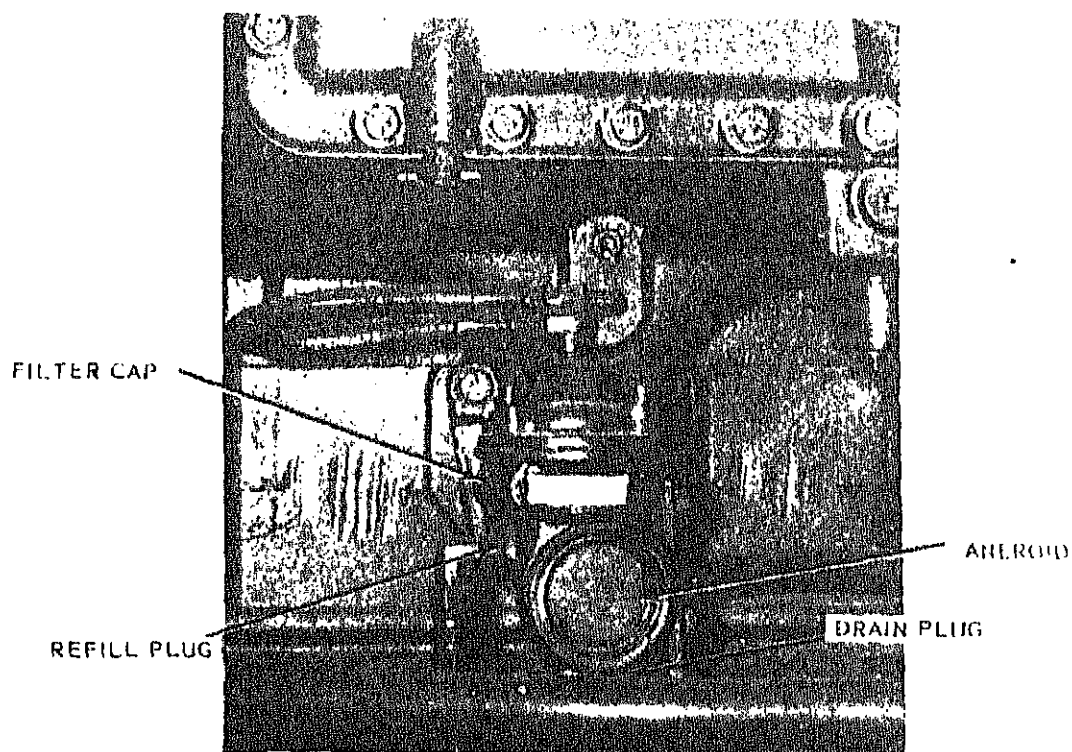


- STEP 1. CLOSE DRAIN COCKS, REMOVE DRAIN PLUG.
 - STEP 2. REMOVE BOLTS, COVER ASSEMBLY AND GASKET FROM CORROSION RESISTER.
 - STEP 3. REMOVE PLATE, CARTRIDGE, PLATE AND SPRING FROM FILTER.
 - STEP 4. USE CLEAN WATER AND FLUSH PLATES; SPRING AND FILTER.
 - STEP 5. OPEN DRAIN COCKS, CORRECT LEAKS, FILL RADIATOR.
- CAUTION: BEFORE ADDING ANY INHIBITING AGENT TO COOLING SYSTEM CLOSE DRAIN COCKS.

NOTE:
WHEN COOLING SYSTEM DOES NOT CONTAIN ANTIFREEZE, USE CHROMATE TYPE FILTER ELEMENT FSN 2930-789-0651, P/N 13272.

U. Aneroid Filter Service

service aneroid filter, figure 3-9.



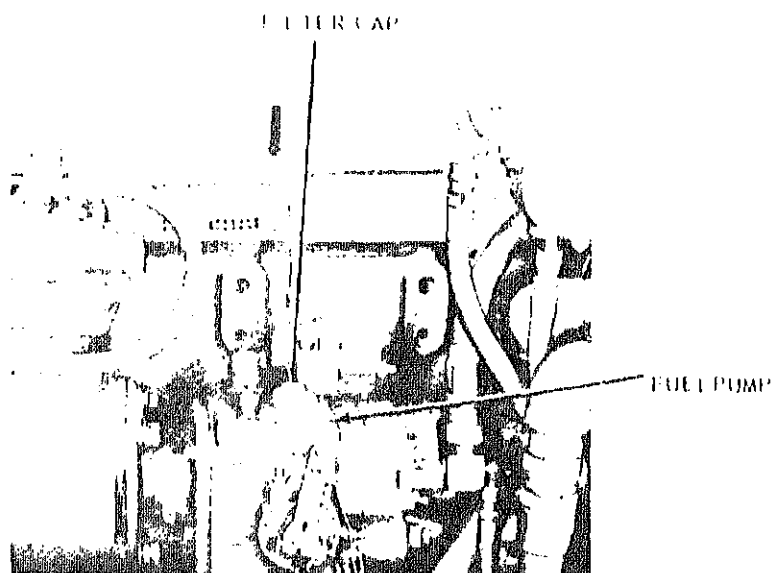
- STEP 1. REMOVE DRAIN PLUG AND DRAIN OIL., REPLACE DRAIN PLUG.
- STEP 2. REMOVE FILTERCAP, SPRING AND FILTER FROM ANEROID.
- STEP 3. CLEAN FILTER WITH SOLVENT, DRY THOROUGHLY.
- STEP 4. INSTALL IN REVERSE ORDER OF REMOVAL.
- STEP 5. REFILL OIL SUPPLY (SEE LO).

ME 2420-206-12/3-9

Figure 3-9. Aneroid filter service.

11. Fuel Pump Filter Service

Service fuel pump filter, figure 3-10.



STEP 1. REMOVE FILTER CAP, GASKET, SPRING, STRAINER CAP AND STRAINER.

STEP 2. FLUSH ALL PARTS WITH DIESEL FUEL. REPLACE DEFECTIVE PARTS.

STEP 3. INSTALL IN THE REVERSE ORDER OF REMOVAL.

ME 2420-206-12-3-10

Figure 3-10. Fuel pump filter service.

12. Breather Service (Small)

a. Remove breathers from midmount bearing, brake fluid reservoirs, fuel tank, transmission housing, front and rear axle housings.

b. Clean breathers in P-D-680 solvent and dry thoroughly. Inspect for damage, replace damaged breathers.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

13. General

a. To insure that the 290M tractor is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. Necessary preventive maintenance checks and

is noted during operation which would damage equipment if operation were continued.

c. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased.

d. All deficiencies and shortcomings will be re-

Item Number	Operator				Org		Item to be inspected	Procedure	
	Daily				M	Q			
	B	D	A	W					
1								LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER	
								COOLANT SYSTEM	
	x			x		x	Coolant level in radiator.	Correct level to 2 inches below filler neck.	
	x					x	Cold weather protection	Service coolant system for lowest freezing temperature expected. <i>Note.</i> Remove corrosion resistor filter before adding an inhibitor to coolant.	TF Fi
			x			x	Radiator air passages.	Clean clogged air passages.	
					x	x	Corrosion resistor (water filter).	Service corrosion resistor (water filter).	Pa
		x				x	Temperature gage reading.	Normal operating temperature is 165° to 195° F. <i>Note.</i> Replace a defective thermostat if temperature cannot be controlled (below 220°F.).	Pa Fi
	x				x	x	Check for coolant leaks.	Correct coolant leaks in lines, hoses fittings, valves, filter, and water manifold. Refer leaks in radiator to DS maintenance.	
				x	x	x	Security of hardware mounted items	Replace missing hardware and secure coolant system items. <i>Note.</i> Refer to DS maintenance as necessary.	
								ENGINE OIL SYSTEM (TURBOCHARGER)	
	x					x	Crankcase oil level.	Correct level to full mark on dip stick gage.	Se
					x	x	Crankcase breather and filters.	Service dirty breather and filters.	Pa
			x			x	Oil pressure gage reading.	At idle engine speed 7-10 psi, at maximum speed 35 psi (min.).	Pa
			x	x		x	Check for oil leaks.	Correct leaks in exposed lines, hoses and fittings. Refer other oil leaks to DS maintenance.	Fi
					x	x	Security of hardware mounted	Replace missing hardware and secure oil system items. <i>Note.</i> Refer to DS maintenance as necessary.	
								FUEL SYSTEM	
	x					x	Level of fuel in tank.	Correct level to full mark on dip stick gage.	
					x	Tank breather.	Service dirty breather	P	
					x	Tank strainer.	Service dirty strainer.	P	
					x	Air cleaner.	Service dirty air cleaner filter.	P	
					x	Aneroid control.	Service control (oil). Service dirty filter.	P	
					x	Pump filter.	Service dirty filter.	P	
					x	Fuel filters.	Service dirty filters.	P	
x	x				x	Check for fuel leaks.	Correct fuel leaks in lines, hoses, fittings (exposed), filters, and tank.	F	

Item Number	Interval						B - Before operation D - During operation	A - After operation W - Weekly	M - Monthly Q - Quarterly	Item to be inspected	Procedure	Reference
	Operator				Org.							
	Daily				M	Q						
	B	D	A	W								
	X				X	X				Batteries (level of electrolyte)	<p>Note. Refer to DS maintenance as necessary.</p> <p>ELECTRICAL SYSTEM</p> <p>Fill to 3/8 inch above plates. In freezing temperature, run engine 1 hour (min.) after adding water. Clean dirty filler caps.</p> <p>WARNING: Do not smoke or use an open flame in vicinity when servicing batteries. Batteries generate hydrogen, a highly explosive gas.</p> <p>Tighten loose cables. Clean corroded connectors. Replace defective cables and batteries.</p>	Fig. 2-1
				X	X	X				Cables.		Fig. 4-48
	X	X				X				Switches (master) (main) (starter) (lights).	Check all switches for proper operation.	Para 2-8
		X			X	X				Ammeter gage reading (includes generator and regulator operation).	Reading is zero to slight charge (plus) after engine start and during normal operation of generator, regulator and engine.	Fig. 2-7
	X	X				X				Check for proper operation to crank engine.	Replace defective starter.	Fig. 4-21
		X				X				Check service, panel and panel warning lights for proper operation.	Replace defective, damaged lamps and lights.	Para 3-14
				X		X				Check wire terminal connections.	Secure loose terminal connectors.	
		X		X						Security of hardware mounted electric control items.	Replace damaged, defective, inoperable warning buzzer.	
		X			X	X				Air pressure gage reading.	<p>AIR SYSTEM</p> <p>During normal engine operation, reading is 90 to 120 psi.</p>	Fig. 2-7
		X					X			Low air pressure gage.	When gage reading is less than 60 psi, buzzer sounds.	
		X				X				Replace damaged, defective, inoperable warning buzzer.		Fig. 4-15
		X				X				Check for air leaks in lines, valves and fittings.	Correct leaks and replace defective valves, controls, lines and reservoirs.	Fig. 1-4
				X	X	X				Security of hardware mounted items.	Replace missing hardware and secure mounted items.	
	X				X	X				Oil level.	<p>BRAKE OIL RESERVOIRS</p> <p>Check level of oil in tank.</p>	See LO
		X		X	X	X				Tank breathers.	Service dirty breathers.	Para 3-12
		X			X	X				Check for oil	Correct leaks, replace damaged.	

Item Number	Interval						Item to be inspected	Procedure	Reference
	Operator				Org.				
	Daily				M	Q			
	B	D	A	W					
7								HYDRAULIC OIL SYSTEMS (TRANSMISSION-CONVERTER) (MAIN)	
		X			X	X	Check transmission oil level.	Check level with engine operating at low idle speed; fill to level mark on dip stick gage.	See LO, p
					X	X	Transmission breather.	Service dirty breather.	Para 3-12
					X	X	Transmission oil filters.	Service dirty filters.	Fig. 3-7
	X	X			X	X	Transmission and converter gage readings.	Normal operating transmission pressure gage reading is 180 to 300 psi. Converter temperature gage reading is less than 250°F.	Fig. 2-7
	X				X	X	Level of oil in main tank.	Fill to level mark on dip stick gage.	See LO
					X	X	Main tank filter and strainer.	Service dirty filter and strainer.	Fig. 3-6
		X		X	X	X	Check for leaks.	Correct leaks in oil lines, filters, hoses, and fittings. Drain and replace if worn, cracked, frayed, or damaged. Refer transmission control valve, converter charging pump and other hydraulic oil leaks to DS maintenance.	Fig. 1-5 and para 3-7
8	X		X		X	X	Cutting edge and end bits.	MOLDBOARD ASSEMBLY Replace worn, broken, distorted cutting edge and end bits.	Para 4-3
	X		X		X	X	Skid shoes.	Replace if worn, damaged, broken, or distorted.	Para 4-6
	X		X		X	X	Scarifier.	Replace worn tooth. Replace broken, distorted shank or shank holder.	Para 4-4
				X		X	Security of hardware mounted items.	Replace missing hardware and secure loose items.	Para 4-1
9				X		X	Cab, hood, glass.	BODY AND FRAME Repair or replace hood. Refer other damage to DS maintenance.	Para 4-17
				X		X	Frame, rock guards, ladders.	Check for creaks, breaks and other damage. Repair or replace rock guard and ladders. Refer other damage to GS maintenance.	Para 4-58
10								TIRES AND FINAL DRIVE (PLANETARY) OIL LEVEL	
	X	X	X		X	X	Air pressure.	Correct tire air pressure is 45 psi (max.), 25 psi (min.).	Para 4-63
	X	X	X			X	Tire wear and damage.	Check for wear, blisters, bruises. Remove imbedded foreign objects.	Para 4-63
	X					X		Replace worn, damaged and defective tires.	TM 9-187
	X		X		X	X	Differential and final drive oil level.	Service differential and final drives (planetary). Report presence of particles in oil to DS maintenance. Prevent oil from contacting tires;	See LO, F

Item Number	Interval				Operator		Org.		B - Before operation D - During operation	A - After operation W - Weekly	M - Monthly Q - Quarterly
	Daily										
	B	D	A	W	M	Q	Item to be Inspected	Procedure	Reference		
	x	x					Midmount bearing mounted on inside front of rear frame unit, driven by a propeller shaft from the transmission and drives a propeller shaft to rear axle.	Check for oil leaks. Refer to DS maintenance as necessary.			
1	x			x	x		Check for wear and defects.	BELTS Replace defective belts.	Paras 4-28, 4-38		
2	x		x	x			Brake assembly.	BRAKES Check for loose nuts. Check for overheated drums. Check for lining wear.	Para 4-50		
3	x			x			Universal coupling.	UNIVERSAL COUPLING Check for creaks, distortion, broken weldments, and other damage, refer to DS maintenance. Service universal coupling.	See LO		
4	x		x				Steering gear ay.	STEERING Check for leaks or other damage. Refer to DS maintenance.			
	x		x			x	Drag link ay.	Check for damage and proper adjustment. Adjust as necessary.	Para 4-21		

Section IV. OPERATOR'S MAINTENANCE

3-14. Control Panel Light Bulbs

a. Remove damaged or defective control panel (para 2-7) warning and panel light lens, reflectors and bulbs.

b. Replace defective light bulbs, tag and disconnect leads and clean lens and reflectors as necessary.

3-15. Tractor Light Lamps

a. **Headlight and Floodlight Lamps.** Remove rubber lamp retainers, disconnect lead and replace damaged or defective sealed beam lamps. Replace retainers as necessary.

b. **Blackout Headlight.** Remove 3 screws and door. Replace damaged or defective sealed beam lamp, disconnect leads. Remove the C-washer and slip off the shell. Assemble in reverse order.

c. **Taillight and Spotlight Lamps.** Remove 2

3-16. Radiator

a. Check to be sure radiator, engine cylinder block, water pump body, and air compressor drain cocks are closed. Remove radiator cap, fill radiator with clean fresh water. Open vent cock at top of thermostat housing (fig. 4-24) to allow trapped air to escape; close the vent cock when water flows from it. Install radiator cap.

Caution: Avoid adding water to a hot engine. Wait until engine has cooled. If necessary to add water to hot engine, add water slowly while the engine is running at a fast idle.

b. **Winter.** Use ethylene-glycol base antifreeze to the percentage required for winter protection. Do not use a corrosion inhibitor in addition to antifreeze. Antifreeze is compatible with the corrosion resistor.

c. **Drainage and Cleaning.**

and run water through cooling system with drain cocks open until water coming out is clean. Close corrosion resistor valves.

(3) *Chemical cleaning.* If excessive rust and

system with a cleaner such as sodium bisulphate or oxalic acid. Follow chemical cleaning by neutralizing and flushing. Always open the corrosion resistor valves during cleaning of cooling system.

Section V. TROUBLESHOOTING

17. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the 290M tractor and its components. Malfunctions which may occur are listed in table

3-2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite each probable cause.

Table 3-2. Troubleshooting

Malfunction	Probable cause	Corrective action
Engine fails to start.	<ul style="list-style-type: none"> a. Master or main switch OFF. b. Fuel tank empty. c. Fuel systems filters dirty. d. Fuel shutdown valve defective. e. Aneroid valve defective. f. Fuel lines leaking or restricted. g. Other causes. 	<ul style="list-style-type: none"> a. Turn switches ON (fig. 2-7). b. Fill tank. c. Service filters (figs. 3-3, 3-9, and 3-10). d. Replace fuel shutdown valve (fig. 4-27). e. Replace aneroid valve (fig. 4-28). f. Correct leaks and replace defective exposed lines (fig. 1-8). g. Refer other causes to DS maintenance.
Starter does not crank engine.	<ul style="list-style-type: none"> a. Master or main switch OFF. b. Electric cable connection loose. c. Defective starter. d. Batteries discharge. e. Starter solenoid defective. f. Faulty starter. g. Starter switch defective. h. Other causes. 	<ul style="list-style-type: none"> a. Turn switches ON. b. Tighten cable connections including battery. c. Replace starter (fig. 4-21). d. Replace batteries, (fig. 4-47). e. Replace starter solenoid, (fig. 4-27). f. Replace starter brushes or starter switch (fig. 4-21). g. Replace starter switch, (fig. 4-15). h. Refer to DS maintenance.
Engine overheats	<ul style="list-style-type: none"> a. Coolant level low. b. Crankcase oil level low. c. Radiator air passages clogged. d. Thermostat defective. e. Other causes. 	<ul style="list-style-type: none"> a. Fill radiator. b. Fill crankcase (see LO). c. Clean air passages. d. Replace thermostat (fig. 4-24). e. Refer to DS maintenance.
Generator output low or not charging.	<ul style="list-style-type: none"> a. Generator belt loose or defective. b. Generator defective. c. Generator regulator defective. d. Cables connections loose. e. Other causes. 	<ul style="list-style-type: none"> a. Replace belt, and correct belt tension. b. Replace generator. c. Replace regulator. d. Tighten connections. e. Refer to DS maintenance.
Batteries do not hold charge	<ul style="list-style-type: none"> a. Electrolyte level low. b. Loose terminals or cables. c. Defective battery. d. Other causes. 	<ul style="list-style-type: none"> a. Add water. b. Tighten connections. c. Replace battery (fig. 4-47). d. Refer to DS maintenance.
Engine knocks.	<ul style="list-style-type: none"> a. Crankcase oil level low. b. Oil leaks in lines and filters. c. Other causes. 	<ul style="list-style-type: none"> a. Fill crankcase (see LO). b. Correct oil leaks. c. Refer to DS maintenance.

Malfunction	Probable cause	Corrective action
8. Brakes do not operate.	<ul style="list-style-type: none"> <i>e.</i> Fuel filters dirty. <i>f.</i> Other causes. <i>a.</i> Air in system trapped. 	<ul style="list-style-type: none"> <i>e.</i> Service fuel filters (fig. 3-3). <i>f.</i> Refer to DS maintenance. <i>a.</i> Bleed air system (fig. 1-4). Correct leaks
9. Main hydraulic system fails.	<ul style="list-style-type: none"> <i>b.</i> Brake oil reservoir breather dirty. <i>c.</i> Low oil in reservoir. <i>d.</i> Other causes. <i>a.</i> Hydraulic oil level low. <i>b.</i> Leaks in lines. <i>c.</i> Tank element dirty. <i>d.</i> Other causes. 	<ul style="list-style-type: none"> <i>b.</i> Service breather (para 3-12). <i>c.</i> Add oil (see LO) Correct leaks. <i>d.</i> Refer to DS maintenance. <i>a.</i> Fill hydraulic tank (see LO). <i>b.</i> Correct leaks. <i>c.</i> Service tank elements (fig. 3-6). <i>d.</i> Refer to DS maintenance.
10. Transmission converter hydraulic system fails.	<ul style="list-style-type: none"> <i>a.</i> Low oil level in system. <i>b.</i> Oil filters dirty. <i>c.</i> Leaks in external line. <i>d.</i> Other causes. 	<ul style="list-style-type: none"> <i>a.</i> Add oil (see LO). <i>b.</i> Service oil filters (fig. 3-5). <i>c.</i> Correct leaks in line (fig. 1-5). <i>d.</i> Refer to DS maintenance.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE PROCEDURES

Section I. BULLDOZER ASSEMBLY

4-1. General

a. *Bulldozer.* The bulldozer consists of a blade, push beams, pitch strut, and skid shoes. The push beams are trunnion mounted to balls on the sides of the frame which provide the pivot points for the push beams. The bulldozer blade is attached to the push beams by pivot pins so that the blade can pivot on the push beams. An adjustable pitch strut is connected between the right push beam and the top of the bulldozer blade. The tilt hydraulic cylinder is connected between the left push beam and the top of bulldozer blade. Adjustable position skid shoes are provided under the fronts of the push beams. The blade is fitted with replaceable cutting edge, and end bits.

b. *Scarifier.* Four scarifiers are bolted to the rear of the bulldozer blade. When released for use, they score the earth while the tractor moves in a reverse direction to allow easier working of the earth with the blade.

c. *Inspection.* Inspect bulldozer assembly and operating components daily for damage or defects.

4-2. Bulldozer End Bits

a. *Removal.* Remove bulldozer end bits as illustrated in figure 4-1.

b. *Cleaning and Inspection.*

(1) Clean all parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage. Replace defective parts as necessary.

c. *Installation.* Install bulldozer end bits as illustrated in figure 4-1.

4-3. Bulldozer Cutting Edge

a. *Removal.* Remove bulldozer cutting edge as illustrated in figure 4-1.

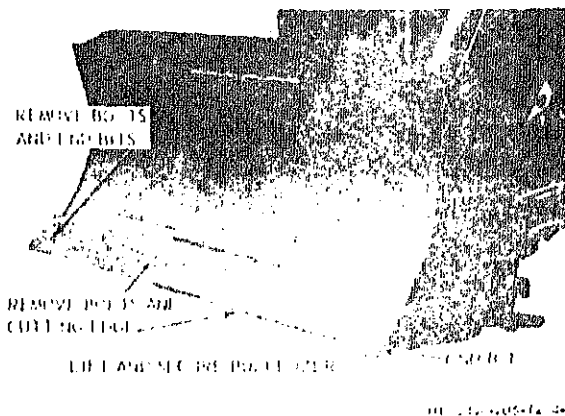


Figure 4-1. Bulldozer cutting edge and end bits, removal and installation.

b. *Cleaning and Inspection.*

(1) Clean all parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage. Replace defective parts as necessary.

c. *Installation.* Install bulldozer cutting edge illustrated in figure 4-1.

4-4. Scarifier Tooth

a. *Removal.* Remove scarifier tooth as illustrated in figure 4-2.

b. *Cleaning and Inspection.*

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage. Replace defective parts as necessary.

c. *Installation.* Install scarifier tooth as illustrated in figure 4-2.

REMOVE SCARIFIER
TOOTH FROM SHANK

SHANK

REMOVE PIN
AND PIN

NOTE:

REMOVE OTHER
SCARIFIER TEETH IN
A SIMILAR MANNER

Figure 4-2. Scarifier tooth, removal and installation.

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4-5. Scarifier Body

a. Removal.

(1) Remove scarifier tooth (para 4-4) and shank from body.

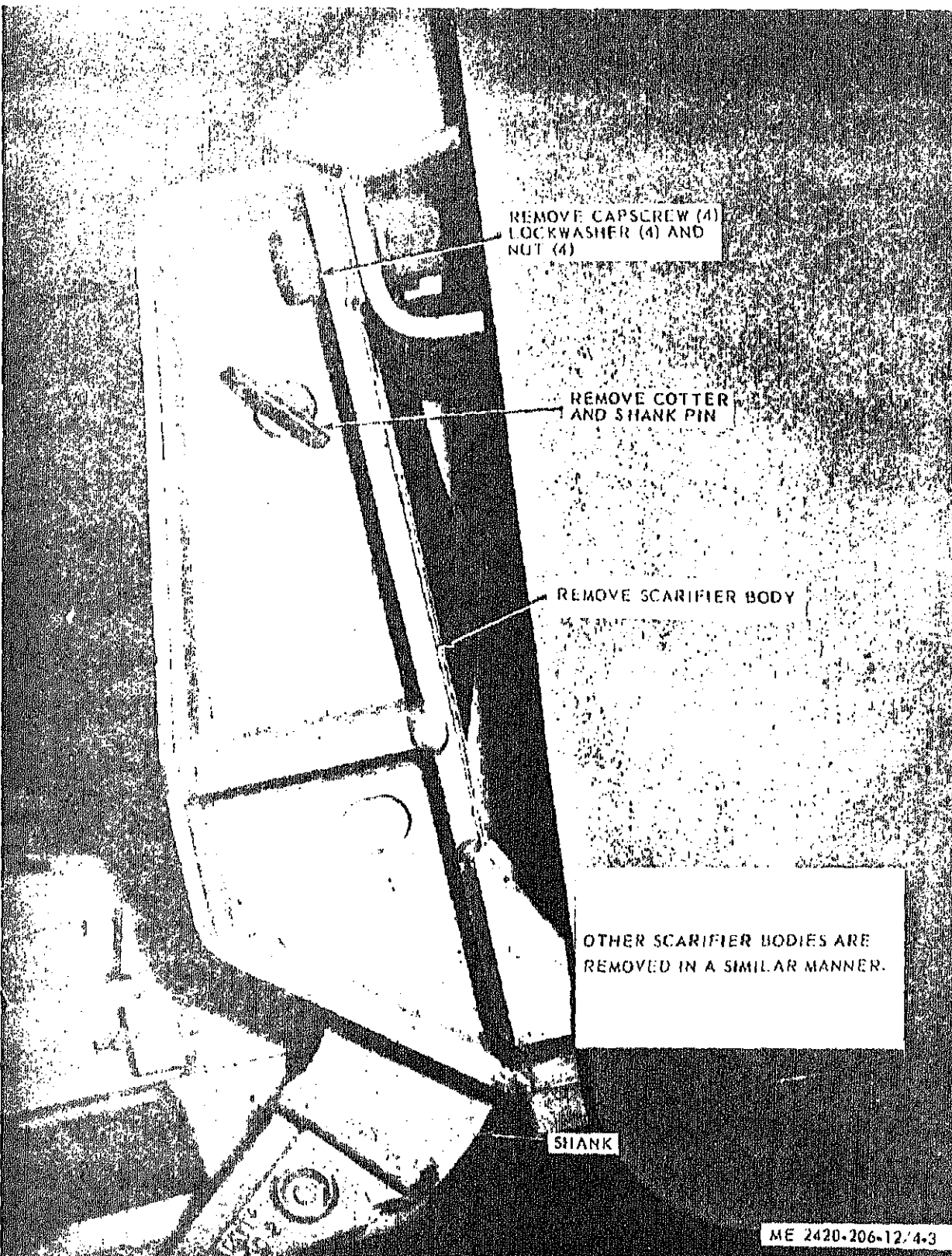
(2) Remove scarifier body as illustrated in figure 4-3.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breakage. Replace damaged scarifier body as necessary.

c. Installation. Install scarifier body in figure 4-3.



REMOVE CAPSCREW (4)
LOCKWASHER (4) AND
NUT (4)

REMOVE COTTER
AND SHANK PIN

REMOVE SCARIFIER BODY

OTHER SCARIFIER BODIES ARE
REMOVED IN A SIMILAR MANNER.

SHANK

a. *Removal.* Remove skid shoe as illustrated in figure 4-4.

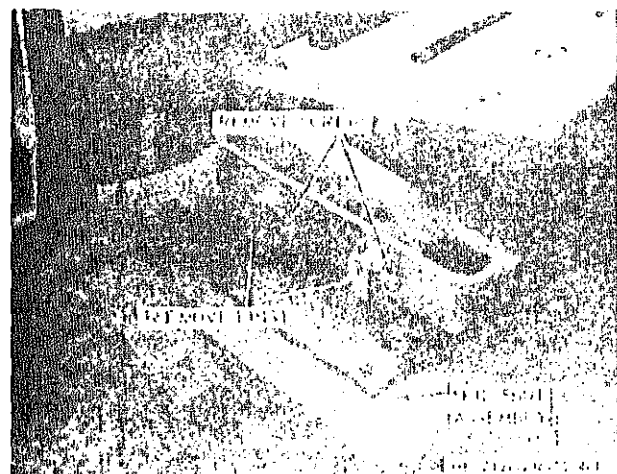


Figure 4-4. Skid shoe, removal and installation.

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks, and damage. Replace all defective parts.

c. *Installation.* Install skid shoes as illustrated in figure 4-4.

Note. Skid shoes are installed only when using the blade for grading material.

4-7. Cylinders

a. *Removal and Disassembly.* Remove and disassemble bulldozer lift and tilt cylinders as illustrated in figure 4-5.

b. *Cleaning and Inspection.*

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and damage. Replace defective parts as necessary. Install wear ring assembly, preformed packing and seals.

c. *Reassembly and Installation.* Reassemble and install bulldozer lift and tilt cylinders as illustrated in figure 4-5. Lubricate interior of cylinder, rings, and piston.

LOWER BLADE TO GROUND
USE A SUITABLE HOLDING, RAISING,
LOWERING DEVICE TO REMOVE AND INSTALL.

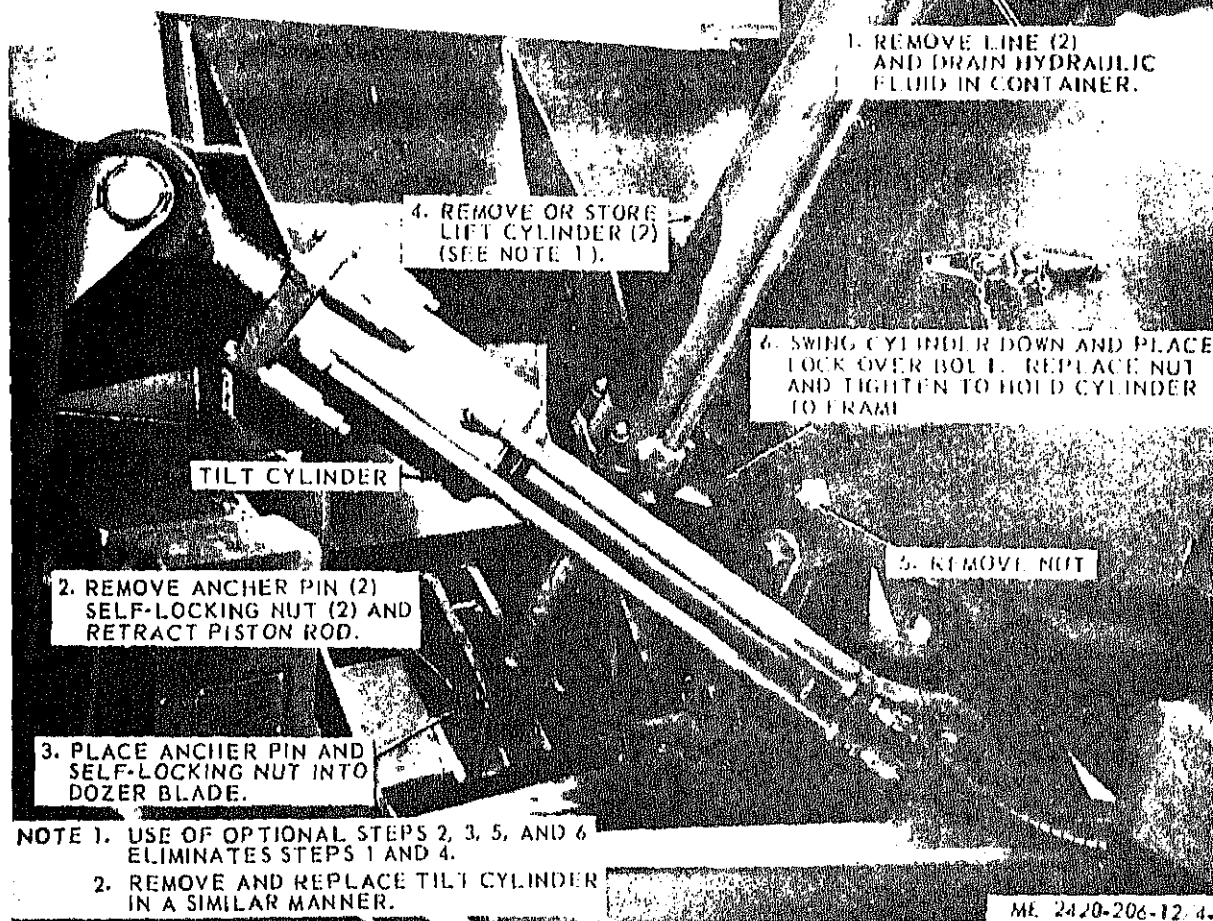


Figure 4-5. Bulldozer lift and tilt cylinder, removal,
disassembly, reassembly, and installation (sheet 1 of 3).

- 1 Nut
- 2 Screw
- 3 Lock
- 4 Cap
- 5 Packing
- 6 Ring
- 7 Pin
- 8 Nut
- 9 Piston
- 10 Ring, packing, seal
- 11 Piston
- 12 Packing
- 13 Wire
- 14 Setscrew
- 15 Retainer
- 16 Wiper
- 17 Gland
- 18 Adapter
- 19 Packing
- 20 Packing
- 21 Adapter
- 22 Rod
- 23 Tube assembly
- 24 Screws
- 25 Bearings (do not remove unless damaged)

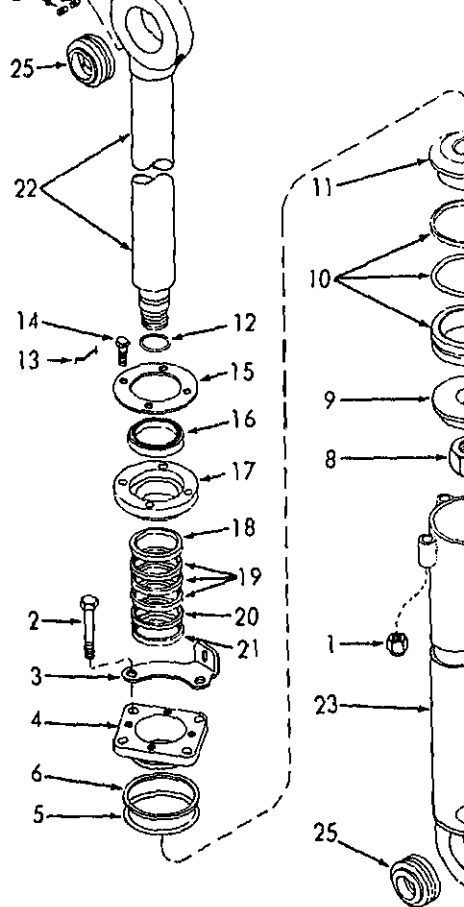
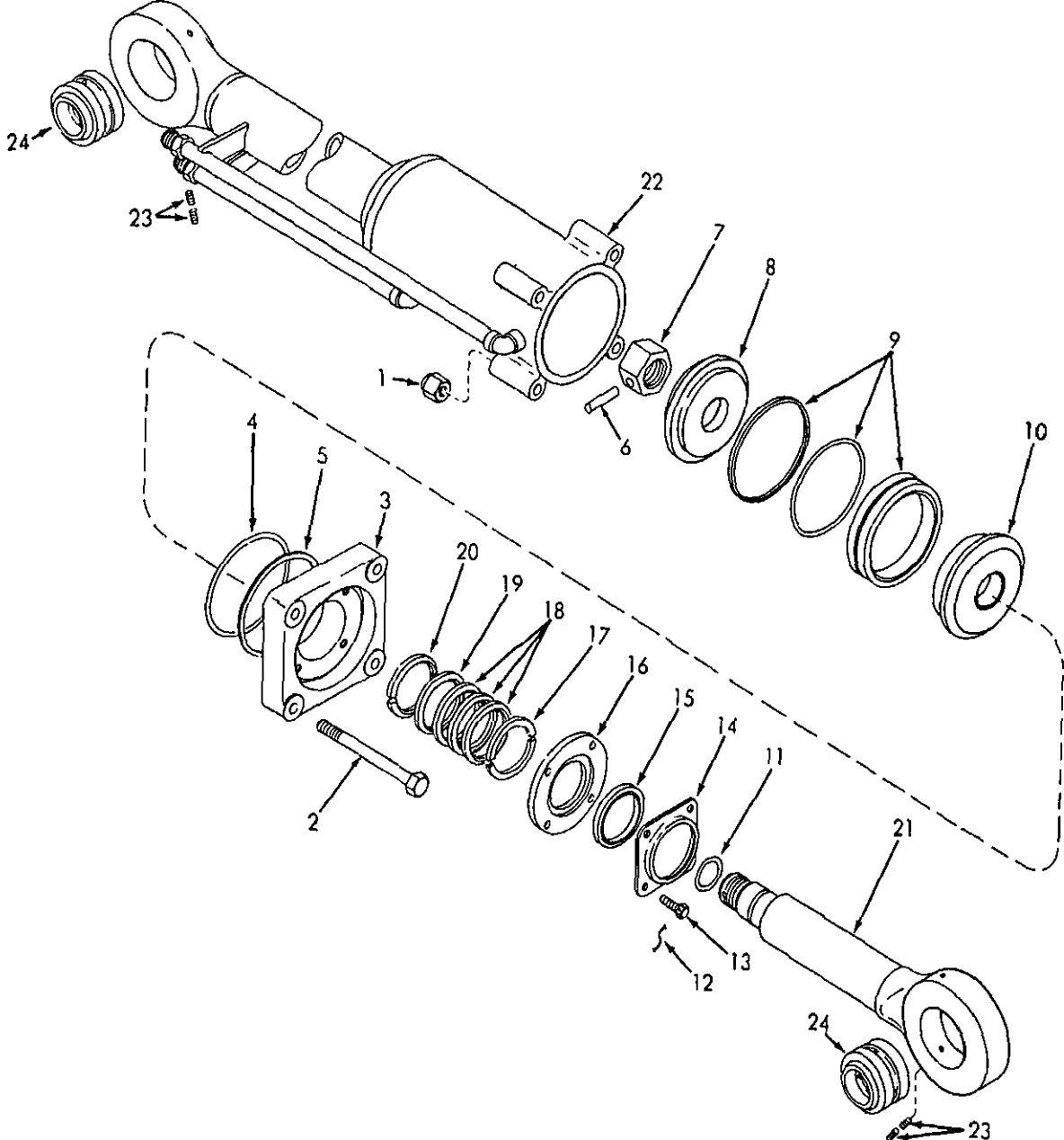


Figure 4-5. Bulldozer lift and tilt cylinder disassembly, reassembly, and installation (s)



ME 2420-206-12/4-5 (3)

- | | |
|---------------------------|--|
| 1 Nut | 13 Screw |
| 2 Screw | 14 Retainer |
| 3 Cap | 15 Seal |
| 4 Ring | 16 Cap |
| 5 Packing | 17 Adapter |
| 6 Pin | 18 Packing |
| 7 Nut | 19 Packing |
| 8 Piston | 20 Adapter |
| 9 Seal, packing wear ring | 21 Rod |
| 10 Piston | 22 Tube assembly |
| 11 Packing | 23 Setscrew |
| 12 Wire | 24 Bearings (do not remove unless damaged) |

pounds, and screws (2) to 50 foot-pounds. Tighten screws (14) finger tight, install lockwire (13).

(2) *Tilt cylinder.* Torque nut (7) to 1,000 foot-pounds, and screws (2) to 320 foot-pounds. Tighten screws (13) finger tight, install lockwire (12).

4-8. Bulldozer Assembly

a. Removal and Disassembly.

(1) Remove cutting edge and end bits (para 4-3).

(2) Remove scarifier body (para 4-5).

(3) Remove skid shoes (para 4-6).

(4) Remove bulldozer cylinders (para 4-7).

(5) Refer to figure 4-6 and remove push beam bearing cap.

dozer blade, push beams, and pitch strut.

b. Cleaning, Inspection, and Repair.

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and damage.

(3) Replace defective parts as necessary.

c. Reassembly and Installation.

(1) Refer to figure 4-7 and reassemble dozer blade, push beams, and pitch strut.

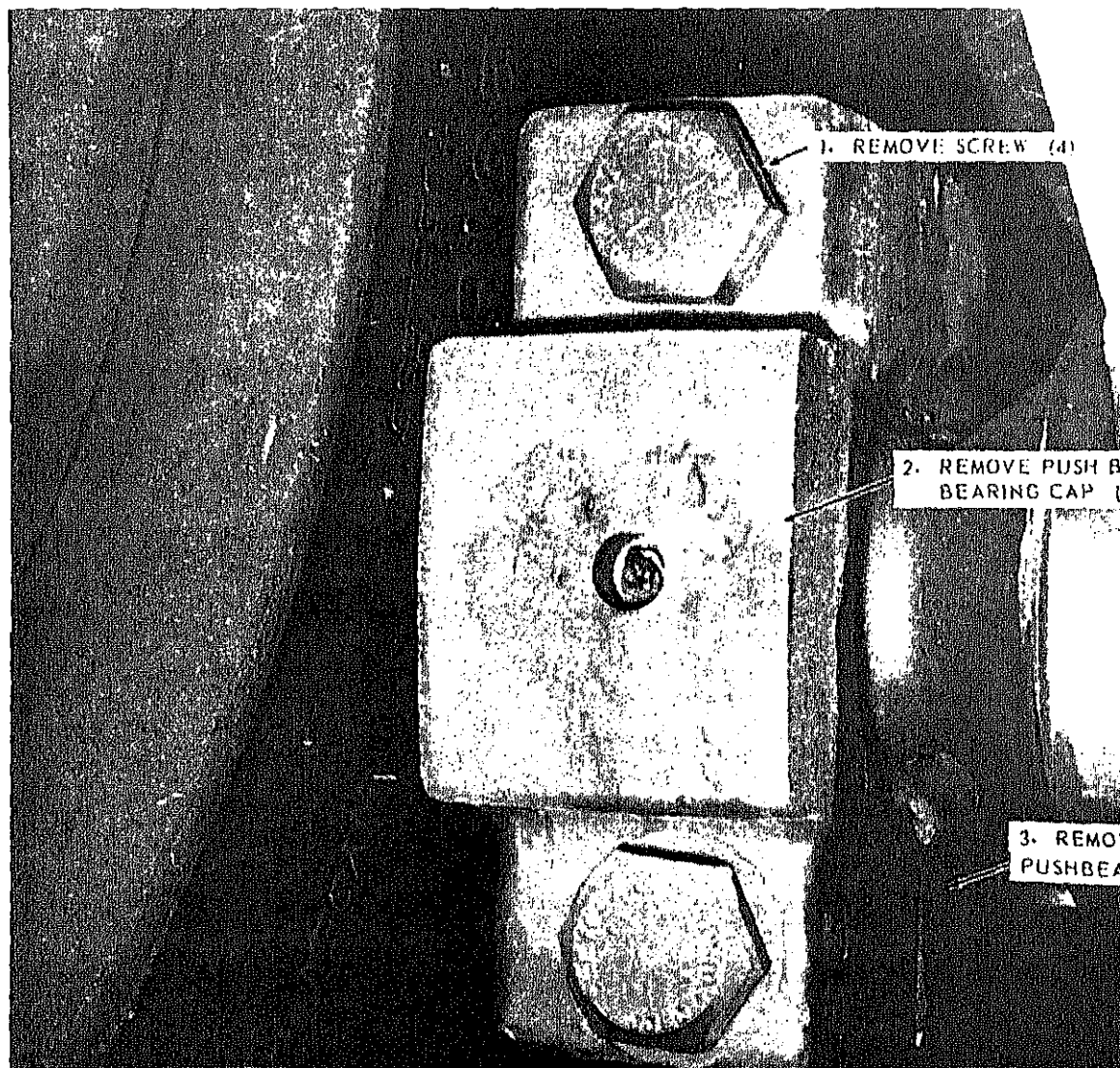
(2) Refer to figure 4-6 and install push beam bearing cap.

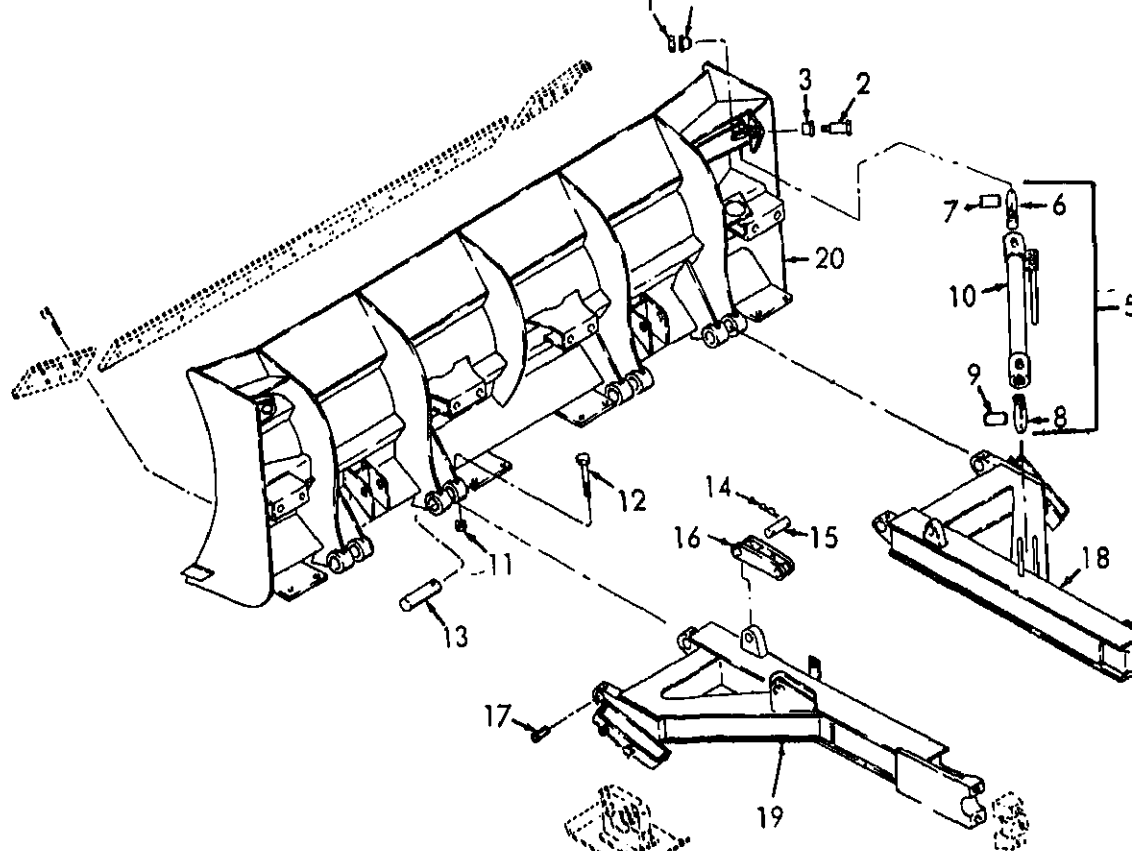
(3) Install bulldozer cylinders (para 4-7).

(4) Install skid shoes (para 4-6).

(5) Install scarifier body (para 4-5).

(6) Install cutting edge and end bits (para 4-3).





NOTE: DO NOT REMOVE ITEMS
3, 4, 7, 9, AND 17 UNLESS DAMAGED.

ME 2420-20

- | | |
|------------------------|-----------------------|
| 1 Nut | 11 Nut |
| 2 Pin | 12 Screw |
| 3 Bearing | 13 Pin |
| 4 Bearing | 14 Pin |
| 5 Pitch strut assembly | 15 Pin |
| 6 Rod | 16 Lock Link |
| 7 Bearing | 17 Bearing |
| 8 Rod | 18 Push beam assembly |
| 9 Bearing | 19 Push beam assembly |
| 10 Pitch Assembly | 20 Blade assembly |

Figure 4-7. Bulldozer blade, push beams, and pitch strut, exploded view.

Section II. TRACTOR LIGHTS

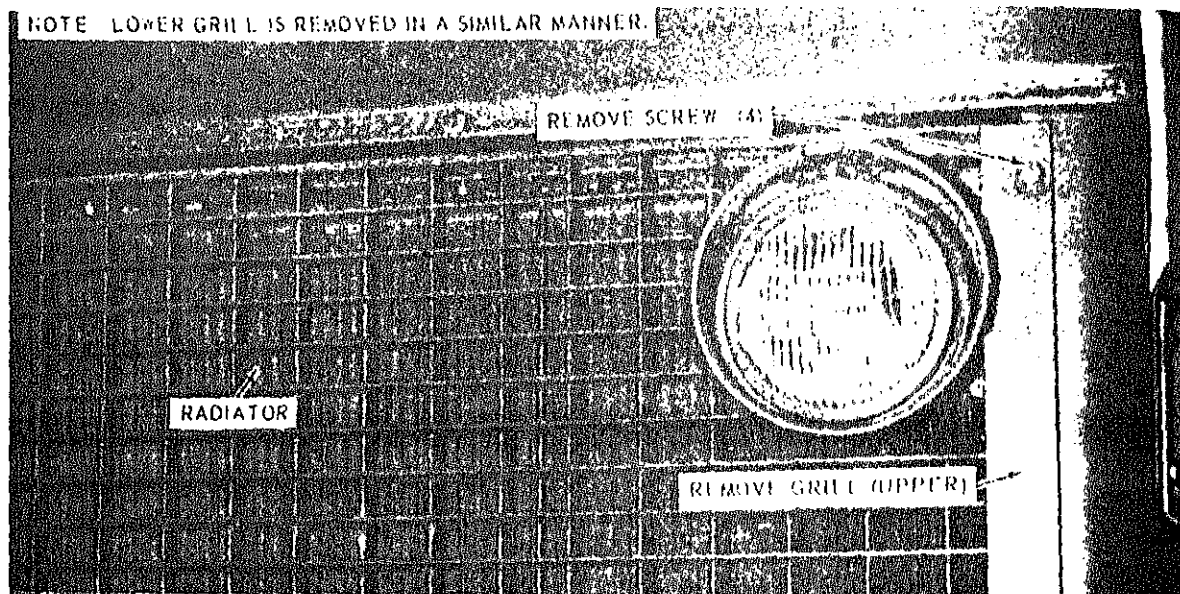
4-9. General

Lights mounted on tractor cab and radiator shroud permits 24 hour continuous operation of equipment.

b. Cleaning and Inspection.

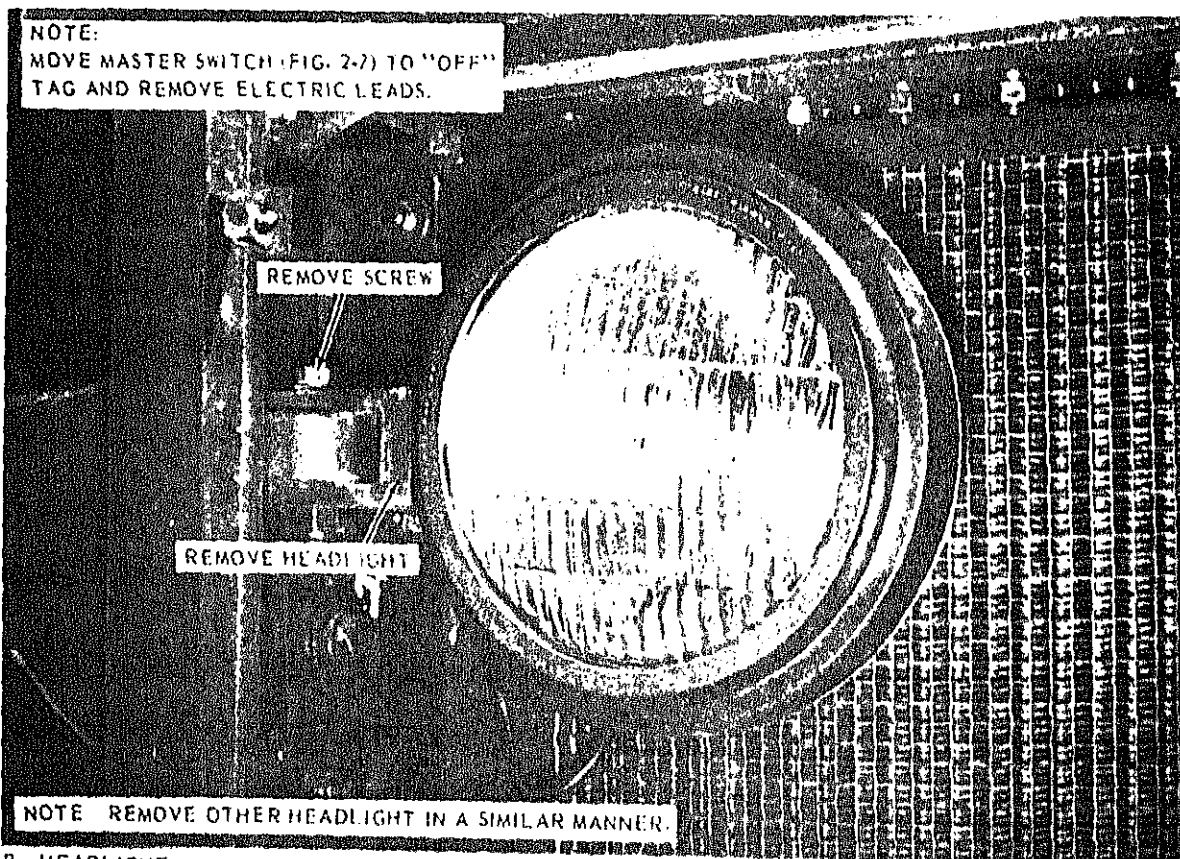
- (1) Clean parts and dry thoroughly.
- (2) Inspect for cracks, breaks and wear. Replace defective headlight as

NOTE LOWER GRILL IS REMOVED IN A SIMILAR MANNER.



A. GRILL

NOTE:
MOVE MASTER SWITCH (FIG. 2-7) TO "OFF"
TAG AND REMOVE ELECTRIC LEADS.



B. HEADLIGHT

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

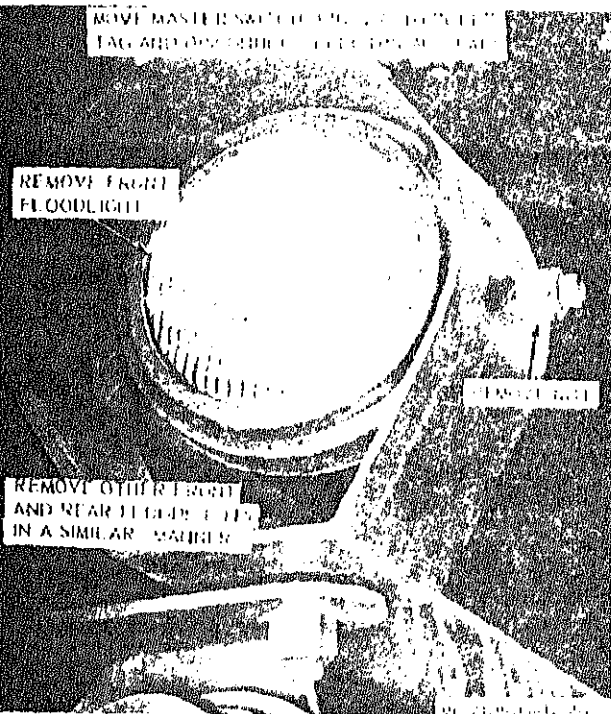


Figure 4-9. Floodlight assembly, removal and installation.

(2) Inspect for cracks, breaks and other damage. Replace defective floodlight assembly and parts as necessary.

c. *Installation.* Refer to figure 4-9 and install floodlight assembly.

12. Blackout Headlight Assembly

a. *Removal.* Refer to figure 4-10 and remove blackout headlight assembly (para 3-15b).

b. *Cleaning and Inspection.*

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective blackout headlight assembly as necessary.

c. *Installation.* Refer to figure 4-10 and install blackout headlight assembly.

13. Tail and Stoplight, Blackout Tail and Stoplight Assemblies

a. *Removal.* Refer to figure 4-11 and remove tail and stoplight, blackout tail and stoplight assembly (para 3-15c and 3-15d).

b. *Cleaning and Inspection.*

(1) Clean parts and dry thoroughly.

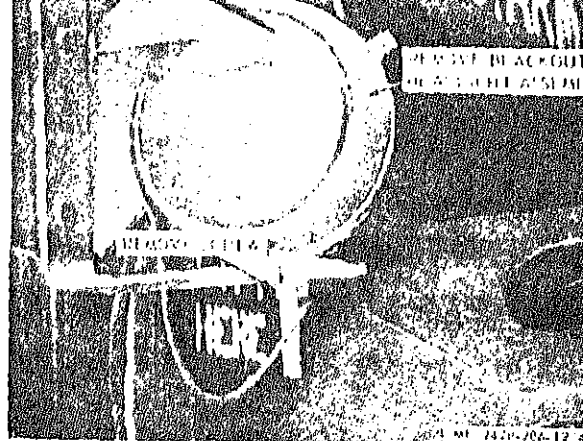


Figure 4-10. Blackout headlight assembly, removal and installation.

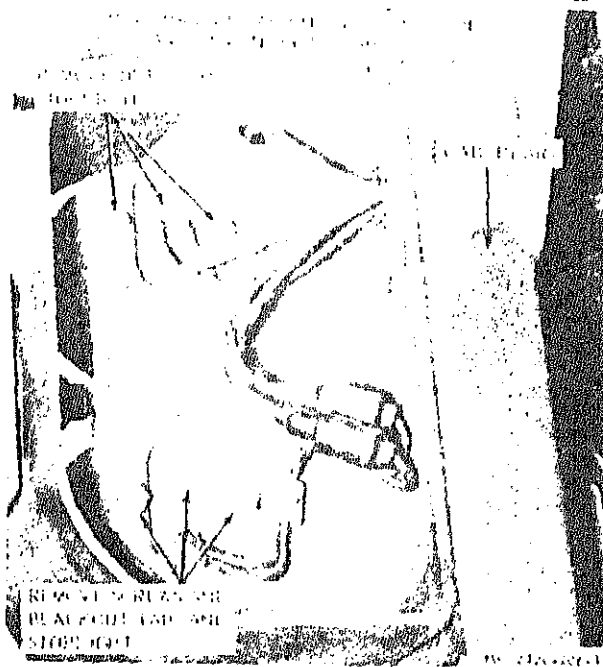
c. *Installation.* Refer to figure 4-11 and install tail and stoplight, blackout tail and stoplight assembly.

4-14. Wiring Harness Repair

a. *General.* Repair of wiring harness pertains to removal and replacement of a defective single wire in the harness.

b. *Test and Inspection.* Use a multimeter to test and inspect wiring for continuity and visual defects.

c. *Removal and Repair.* Remove damaged wire and replace with wire of same size, length and insulation. Install wire using an approved connector.



4-15. General

The engine mounted turbocharger uses an air cleaner and aspirator assemblies that are hood mounted and piped to and from intake manifold, air cleaner and aspirator.

4-16. Aspirator and Exhaust Pipe

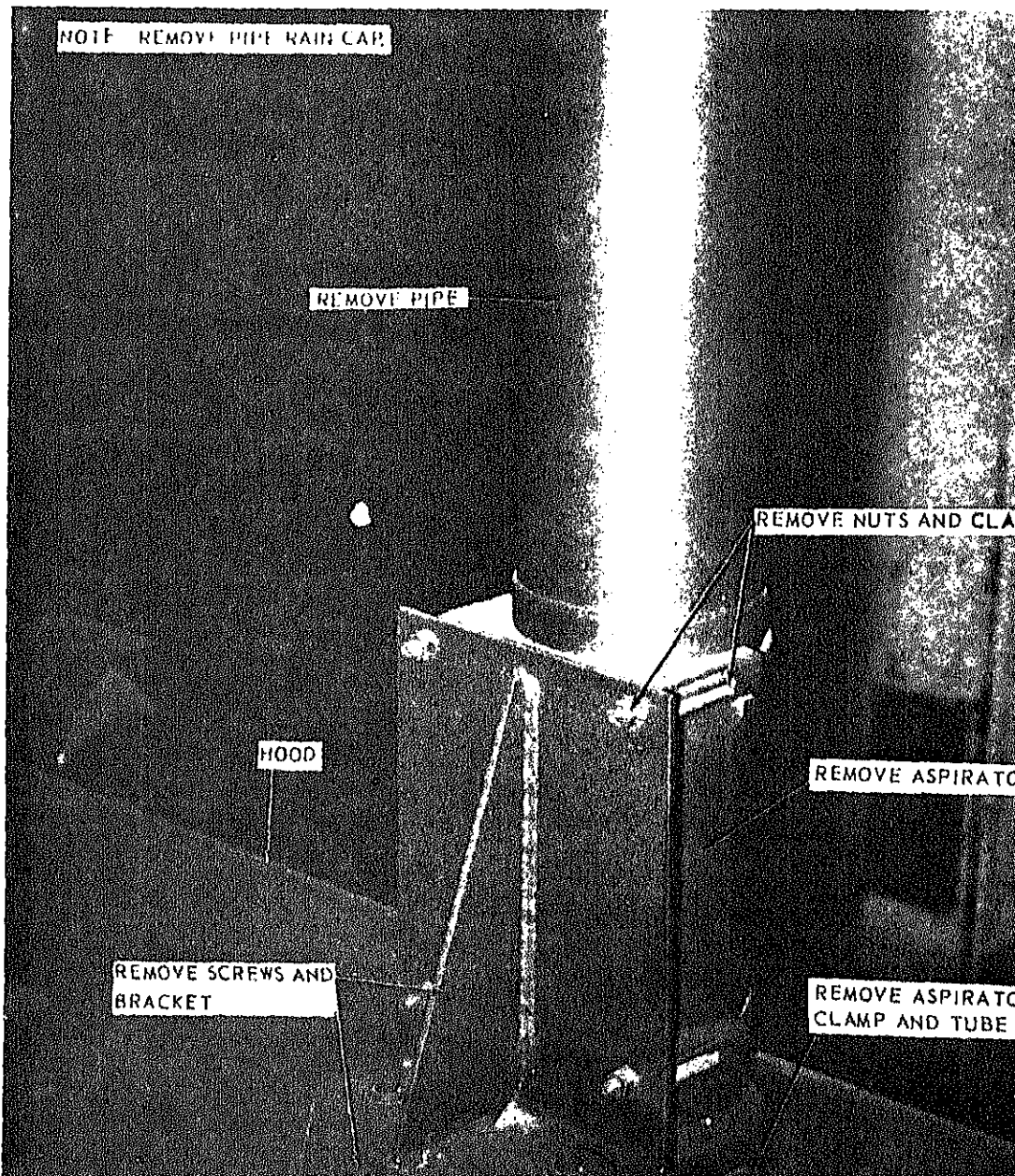
a. *Description.* The aspirator creates a suction

caused by exhaust gases passing through the turbine of the aspirator. As the gases pass through the turbine, the air is accelerated causing a decrease in pressure, creating a suction pulling dirt particles from the air cleaner.

b. *Removal.* Refer to figure 4-12 and

(1) Remove exhaust pipe.

(2) Remove aspirator.



c. Cleaning and Inspection.

- (1) Clean parts and dry thoroughly.
- (2) Inspect parts for cracks, breaks and other damage. Replace defective parts as necessary.

d. Installation. Refer to figure 4-12 and install aspirator and exhaust pipe in reverse order of removal.

17. Air Cleaner, Piping and Hood

a. Description. The air cleaner consists of a pre-cleaner and paper-type filter cartridge which operate together to remove dirt particles from the air before they enter the engine. As air enters pre-cleaner, it passes through deflectors which impart a high speed spin to the air stream. The centrifugal force throws dirt particles outward, out of the air stream before the air enters the filter cartridge, leaving only small particles to become trapped in cartridge. Particles thrown from air stream drop to bottom of pre-cleaner into a self-cleaning dust bin. The bin is cleaned by an air stream created by suction from the aspirator. The cleaned air is pulled to turbocharger and forced into the intake manifold of the engine under pressure. Pressurizing air enables more air to enter engine, which permits more fuel to be burned. This results in greater engine power. A vacuum-operated air system restriction indicator indicates when filter is dirty. The indicator is connected to the side of the air cleaner by a tube.

b. Removal and Disassembly.

- (1) Remove aspirator (para 4-16).
- (2) Remove radiator grill (fig. 4-8).
- (3) Remove and disassemble air cleaner piping and hood as illustrated in figure 4-13. Always cover turbocharger openings when disconnecting turbocharger lines to prevent entry of dirt and foreign objects.

c. Cleaning and Inspection.

- (1) Clean metal parts and dry thoroughly.
- (2) Inspect all items for cracks, breaks, and other damage. Inspect for loose hoses and fittings. Replace defective parts as necessary.

d. Reassembly and Installation.

- (1) Reassemble and install hood and air cleaner.

4-18. Turbocharger and Manifold

a. Description. The turbocharger forces additional air into engine combustion chambers so engine burns more fuel, enabling engine to develop more horsepower. The turbocharger consists of a turbine wheel and a centrifugal blower, separately encased, but mounted on and rotating with a common shaft. The turbine side of the turbocharger mounts to exhaust manifold outlet flange, and the blower side connects with the air intake manifold. Lubrication is supplied by the engine lubrication system.

b. Impeller Service.

Note. After each 1,000 hours of engine operation perform turbocharger impeller service as contained herein.

- (1) Remove intake air piping items (14, 15, and 16) as illustrated in figure 4-13. Remove air intake manifold from turbocharger assembly.

- (2) Remove carbon deposits from inside of impeller and diffuser plate using an appropriate cleaning (non-abrasive) method.

- (3) Using a suitable microinch measuring device, check impeller for end play (max. 0.008 in).

- (4) Replace turbocharger assembly as necessary. Install intake air piping items (14, 15, and 16) as illustrated in figure 4-13).

c. Removal.

- (1) Remove intake air piping items (14, 15, and 16 in fig. 4-13) and exhaust piping items (2 and 3) as illustrated in figure 4-13).

- (2) Remove turbocharger as illustrated in figure 4-14. Cover exhaust port in manifold to prevent entry of dirt into engine.

d. Cleaning and Inspection.

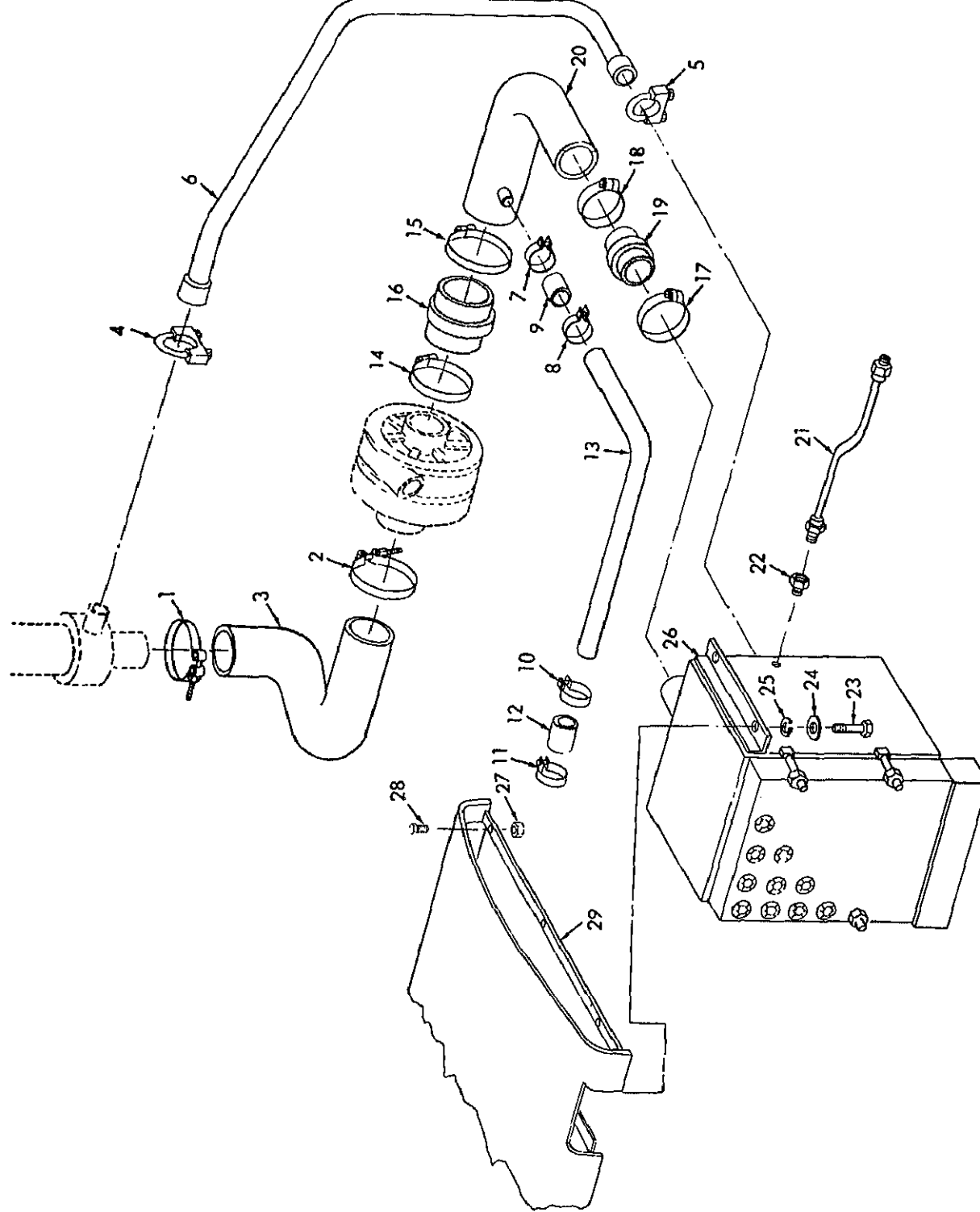
- (1) Clean parts and dry thoroughly.
- (2) Inspect for cracks, breaks and other damage. Replace defective turbocharger as necessary.

e. Installation.

- (1) Install turbocharger as illustrated in figure 4-14.

- (2) Install items (2, 3, 14, 15, and 16 in figure 4-13).

f. Manifold Inspection. Check for frayed or broken hose, loose hose clamps, damaged



assembly

ner assembly

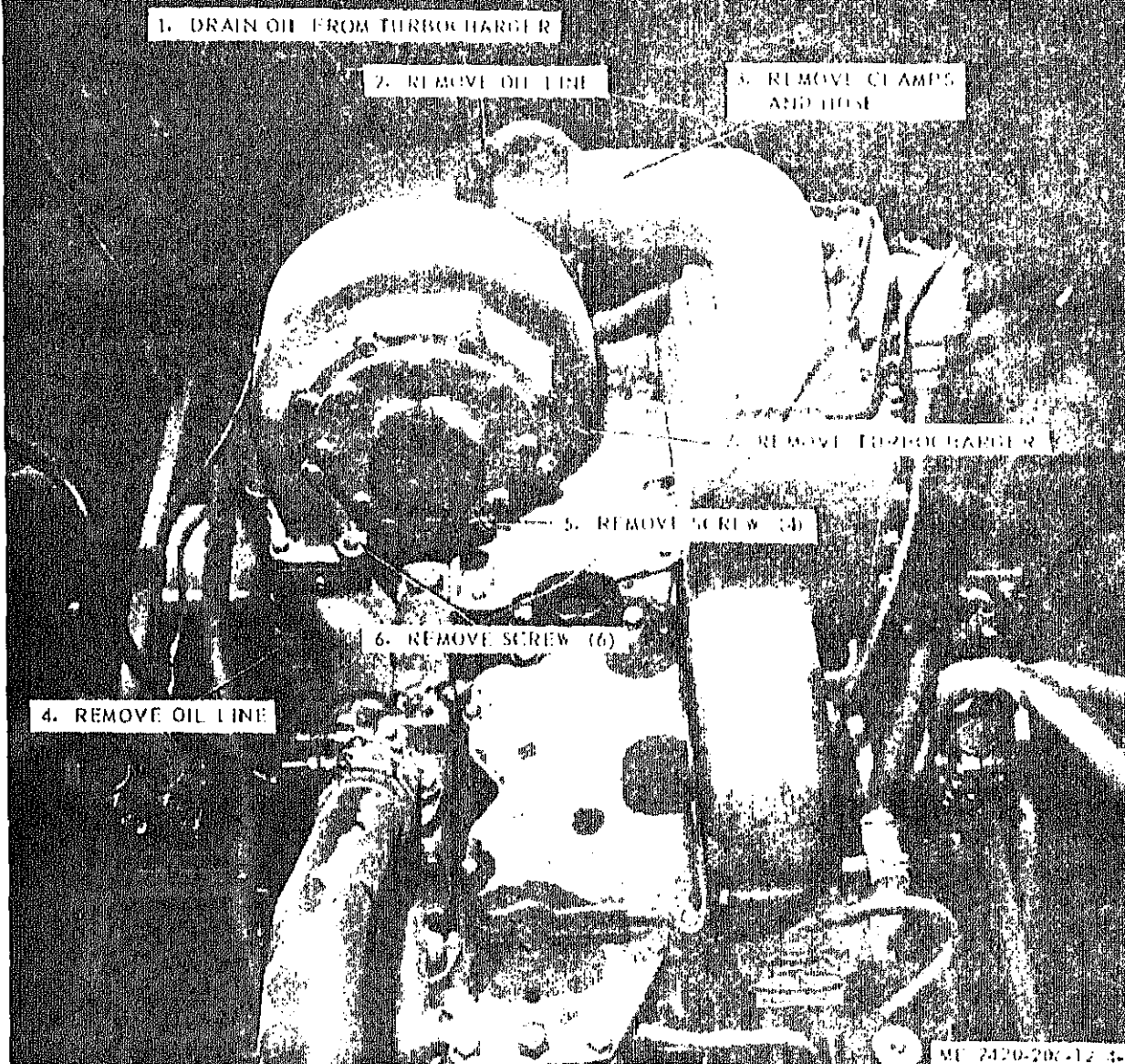


Figure 4-14. Turbocharger, removal and installation.

Section IV. CONTROLS AND INSTRUMENTS

4-19. General

a. Instruments and controls are mounted on sheet metal panels and installed on right and left side of the tractor dash panel. Air lines, oil lines, electrical wiring, and speed cables are attached to applicable

4-20. Controls and Instruments

a. Removal.

(1) *Master switch.* Move master switch (2-7) to OFF position. Tag controls and instruments, piping, wiring, and cables, remove

screws securing circuit breaker to dash panel.

(b) Inspect and test.

1. Inspect for loose terminals or cracked insulator case.

2. Connect each circuit breaker in series with a 24-volt DC power source and a test lamp. Short across terminals of test lamp after lamp is lit. The circuit breaker should open the circuit and the lamp should not light when short is removed. The circuit breaker should close the circuit again and the test lamp should light after a short time has elapsed. Replace a defective circuit breaker.

(3) Instrument panel.

(a) Remove screws securing instrument panel to dash panel and remove instrument panel from dash panel.

(b) Inspect for cracks, breaks and other damage. Replace as necessary.

(4) Starting aid. Remove starting aid as

illustrated in figures 2-12 and 4-16.

b. Cleaning and Inspection.

(1) Clean lines, cables and wires.

(2) Inspect lines and fittings for breaks, cracks and other damage. Inspect cables for damage and defects. Inspect wiring for defects. Replace defective lines, fittings and cables as necessary. Repair or replace wiring as necessary. Refer to figure 1-1. Replace all preformed packings, gaskets and all defective parts of the starting aid.

c. Installation.

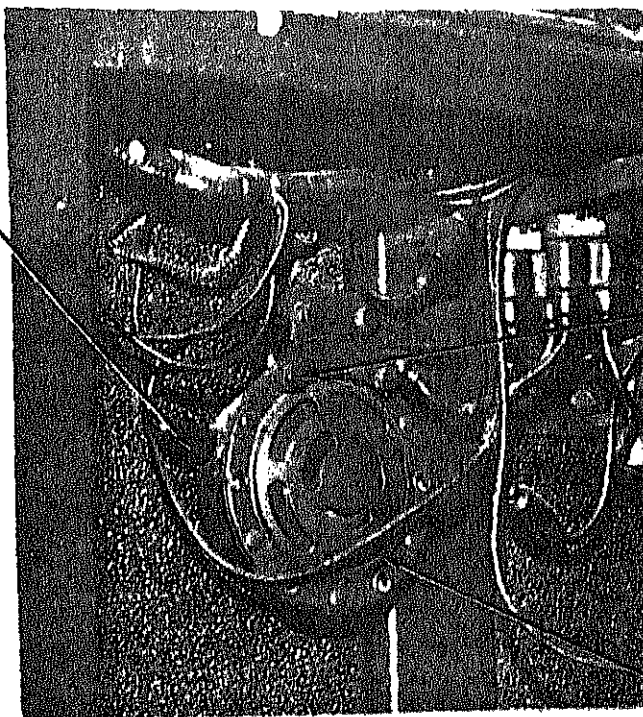
(1) Install starting aid as illustrated in figure 4-15.

(2) Install instrument panel on dash panel.

(3) Install circuit breakers on dash panel.

(4) Install instruments and controls in reverse order of removal, figure 4-15. Do not break or kink capillary tubing.

TAG AND REMOVE
ELECTRICAL LEAD.



REMOVE SCREW

REMOVE OVERSPEED
WARNING HORN

TAG AND
REMOVE
ELECTRICAL
LEAD

REMOVE LOW AIR PRESSURE
WARNING BUZZER

NOTE. LOCATED UNDER
INSTRUMENT PANEL.

REMOVE SCREW (3)

ME 2420-206-12 4-15 '2

*Figure 4-15. Controls and instruments, removal and installation,
(sheet 2 of 10).*

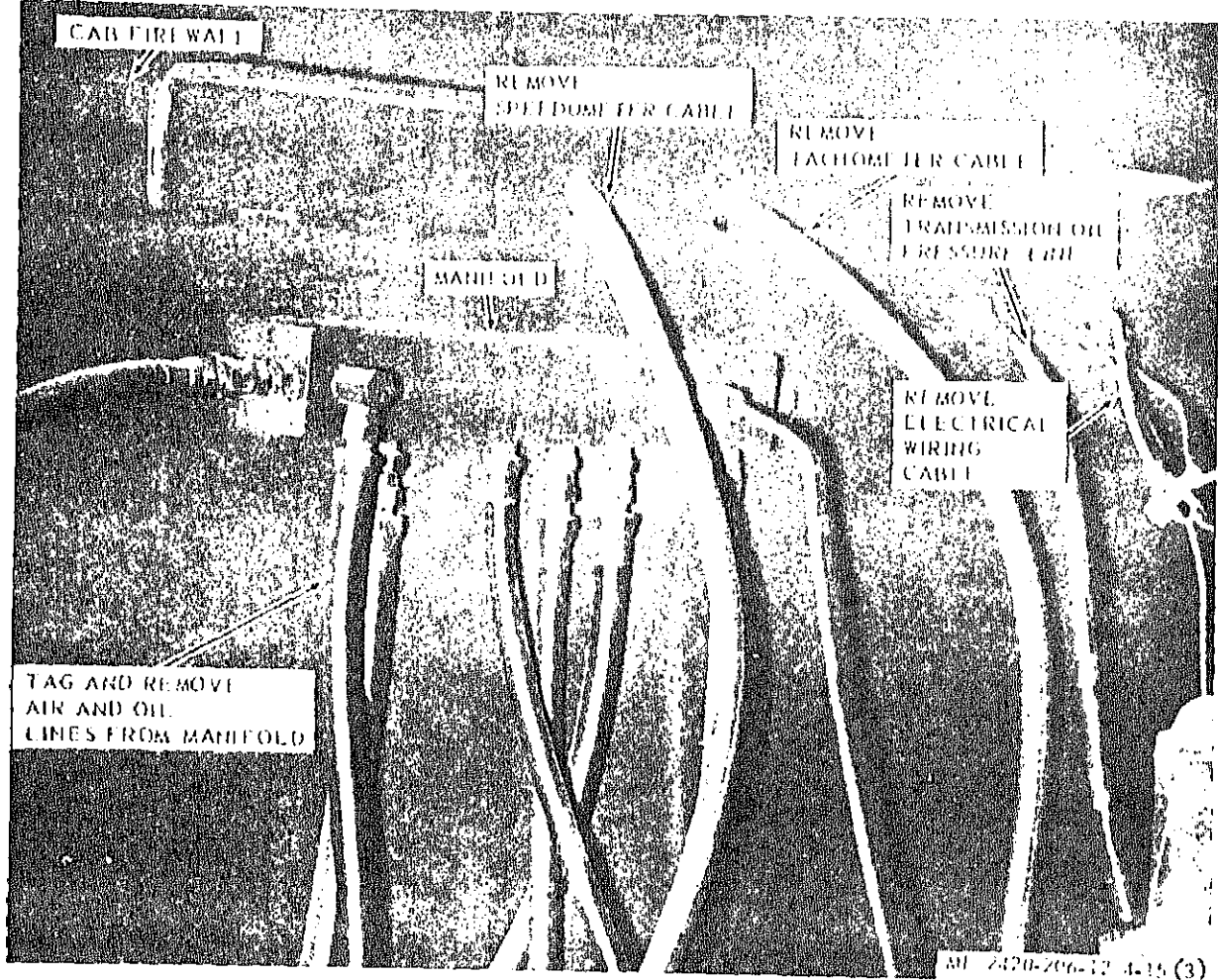
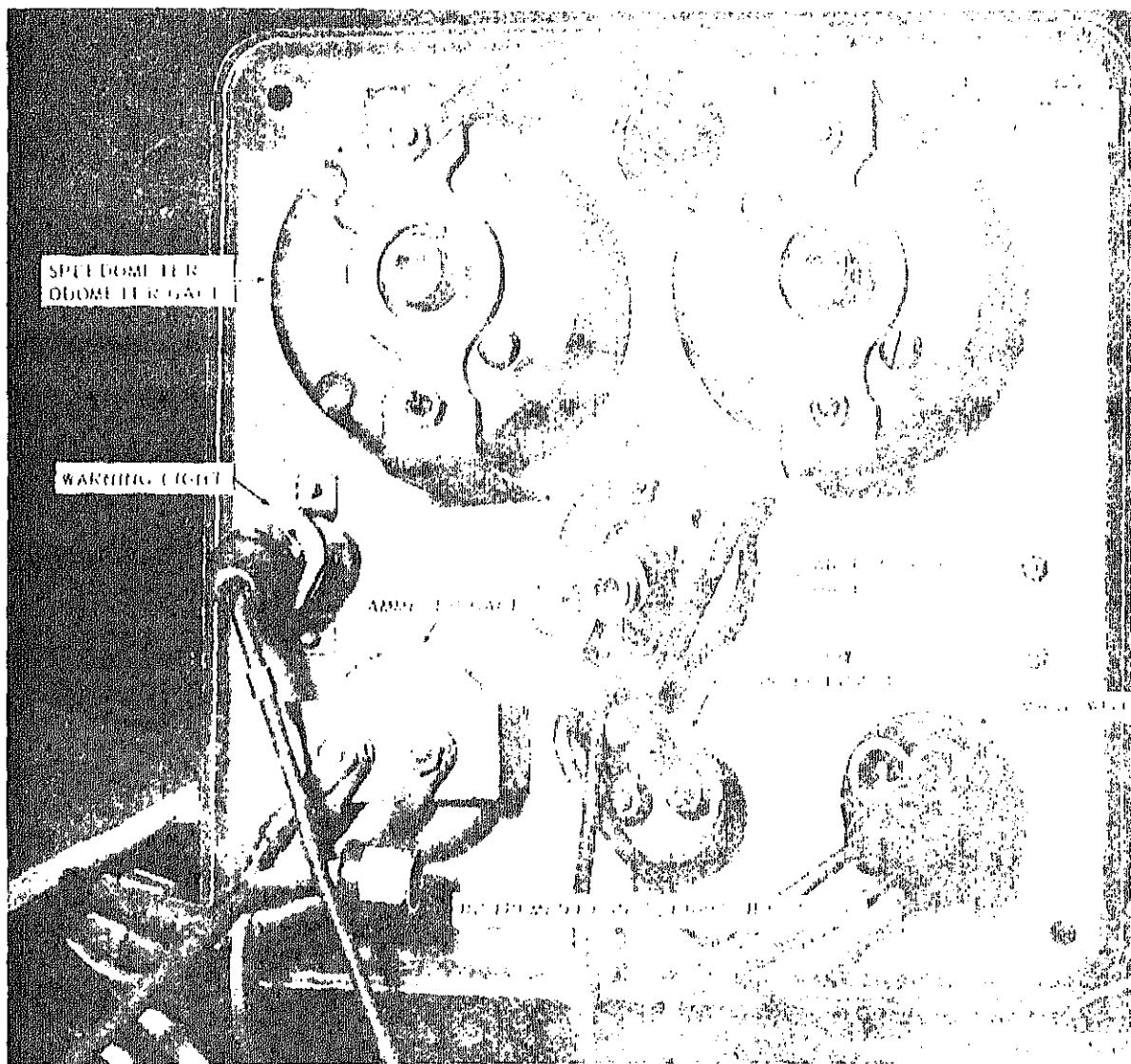


Figure 4-15. Controls and instruments, removal and installation,
(sheet 3 of 10).



*Figure 4-15. Controls and instruments, removal and installation,
(sheet 4 of 10).*



Figure 4-15. Controls and instruments, removal and installation,
(sheet 5 of 10).

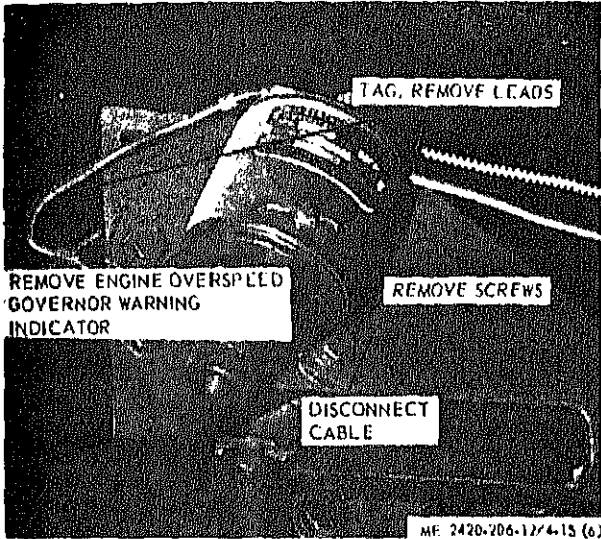


Figure 4-15. Controls and instruments, removal and installation,
(sheet 8 of 10).

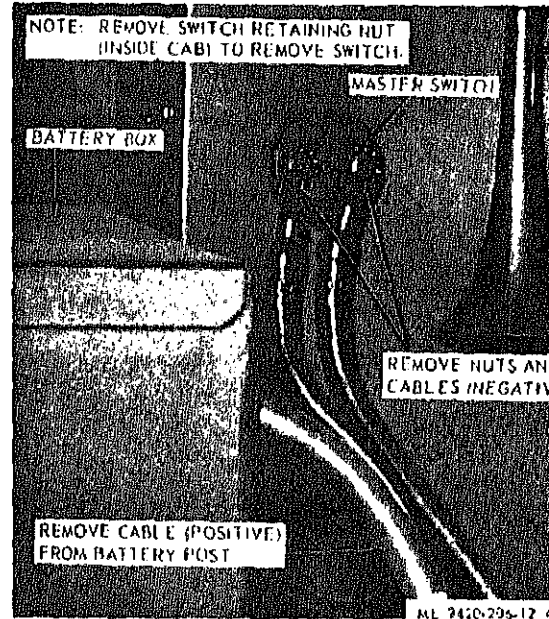
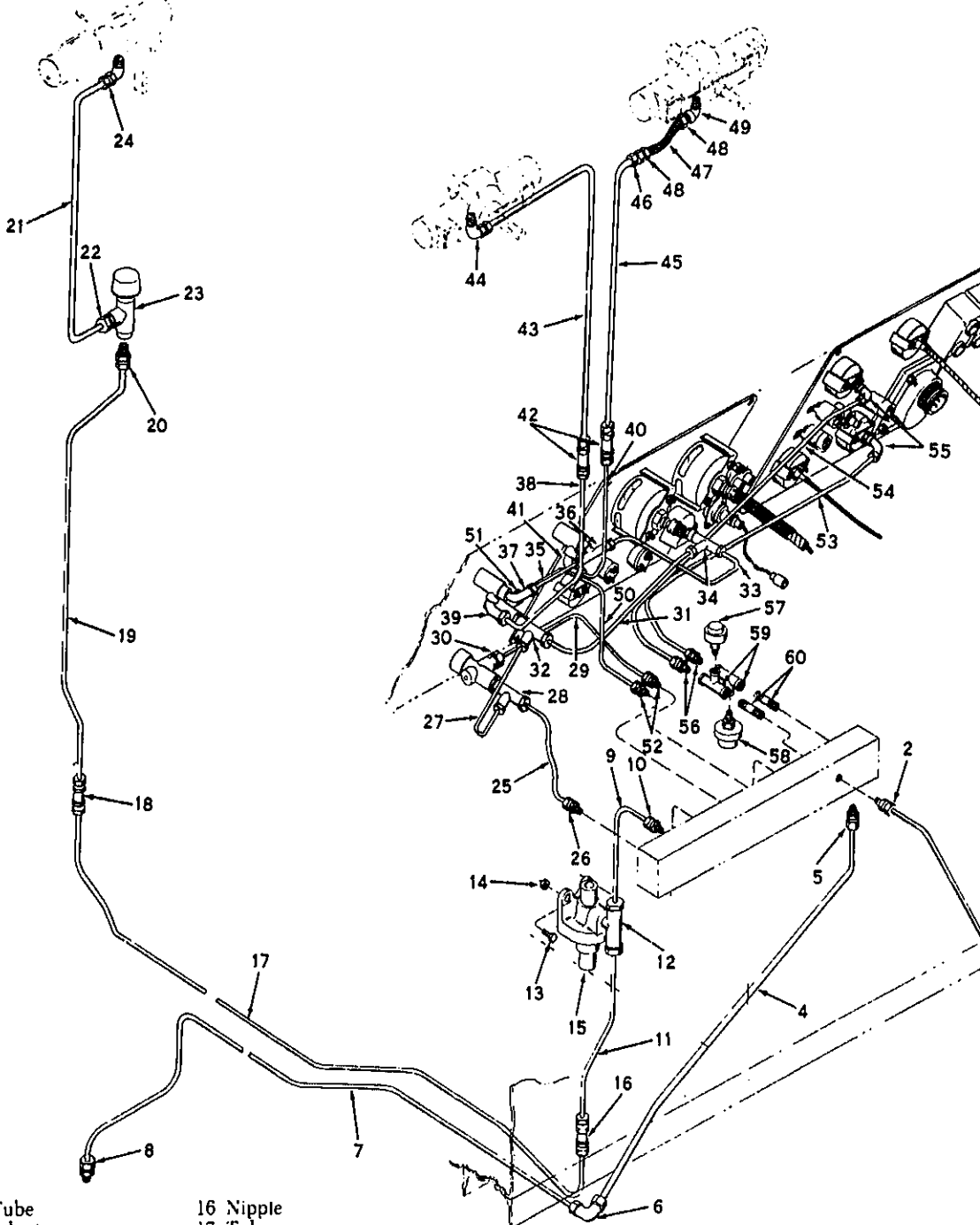


Figure 4-15. Controls and instruments, removal and installation,
(sheet 7 of 10).



- | | |
|------------|--------------------|
| 1 Tube | 16 Nipple |
| 2 Adapter | 17 Tube |
| 3 Adapter | 18 Nipple |
| 4 Tube | 19 Tube |
| 5 Adapter | 20 Adapter |
| 6 Elbow | 21 Tube |
| 7 Tube | 22 Adapter |
| 8 Adapter | 23 Switch assembly |
| 9 Tube | 24 Elbow |
| 10 Adapter | 25 Tube |
| 11 Tube | 26 Adapter |
| 12 Tee | 27 Tube |
| 13 Screw | 28 Tee |

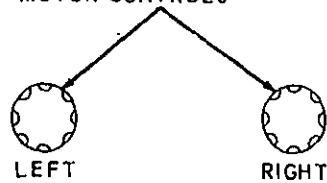
- | |
|----------|
| 31 Tube |
| 32 Tee |
| 33 Tube |
| 34 Tee |
| 35 Tube |
| 36 Tee |
| 37 Elbow |
| 38 Tube |

- | |
|------------|
| 41 Elbow |
| 42 Nipple |
| 43 Tube |
| 44 Elbow |
| 45 Tube |
| 46 Adapter |
| 47 Hose |
| 48 Fitting |

- | |
|------------|
| 51 Adapter |
| 52 Adapter |
| 53 Tube |
| 54 Tube |
| 55 Elbow |
| 56 Adapter |
| 57 Switch |
| 58 Switch |

ME 2420-206-12/4

FRONT WINDSHIELD WIPER
MOTOR CONTROLS



AIR RESERVOIR
MOISTURE VALVE
DRAIN CONTROL



TRACTOR-TRAILER
OPERATING PROTECTION
CONTROL LEVER
(NORMALLY IN NORMAL
POSITION)

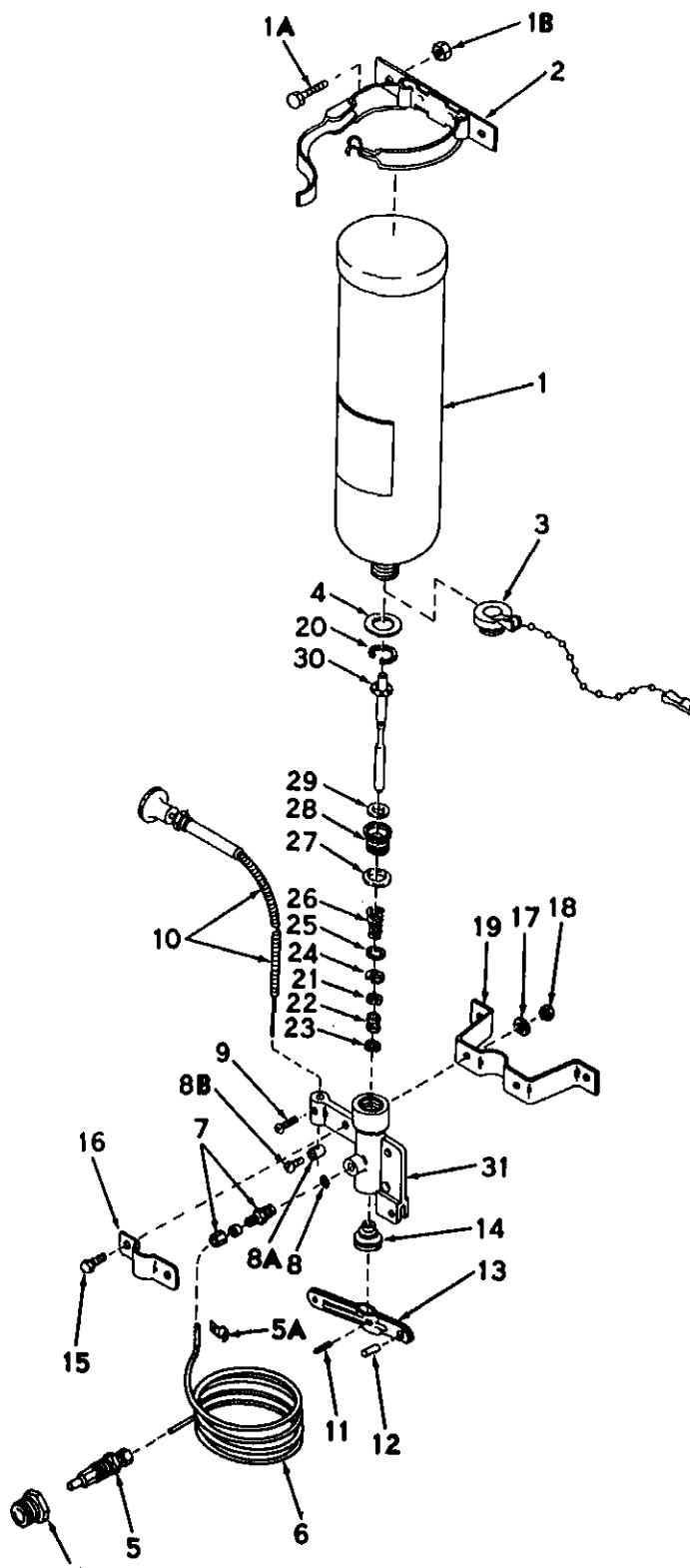


ENGINE QUICK START
(ETHER AID) CONTROL
(SEE FIG. 4-15 ⑩)

ME 2420-206-12/4-15 ⑨

*Figure 4-15. Controls and instruments, removal and installation,
(sheet 9 of 10).*

- 1 Fuel cylinder
- 1A Capscrew
- 1B Self-locking nut
- 2 Clamp and bracket
- 3 Chain cap
- 4 Gasket
- 5 Manifold fitting
- 5A Clip
- 6 Tube
- 7 Adapter
- 8 Screen
- 8A Throttle stop
- 8B Machine screw
- 9 Machine screw
- 10 Choke cable
- 11 Roll pin
- 12 Hinge pin
- 13 Lever
- 14 Plug
- 15 Capscrew
- 16 Identification plate
- 17 Washer
- 18 Nut
- 19 Bracket
- 20 Retaining ring
- 21 Preformed packing
- 22 Separator
- 23 Preformed packing
- 24 Retaining ring
- 25 Washer
- 26 Spring
- 27 Preformed packing
- 28 Guide
- 29 Preformed packing
- 30 Pusher pin
- 31 Body
- 32 Bushing



4-21. Steering Wheel, Trailer Brake Control and Drag Link Adjustment

a. *Removal.* Remove steering wheel and trailer brake control as illustrated in figure 4-16. Remove screws (9) from retainer (10), pry simultaneously with two small screwdrivers on opposite edges of

retainer to remove. Remove cap (11), horn button (12), insulator (13), spring (14), and contact (15). Remove nut (16) from steering gear assembly (17) and use a puller to pull steering wheel (17). Remove key (18).

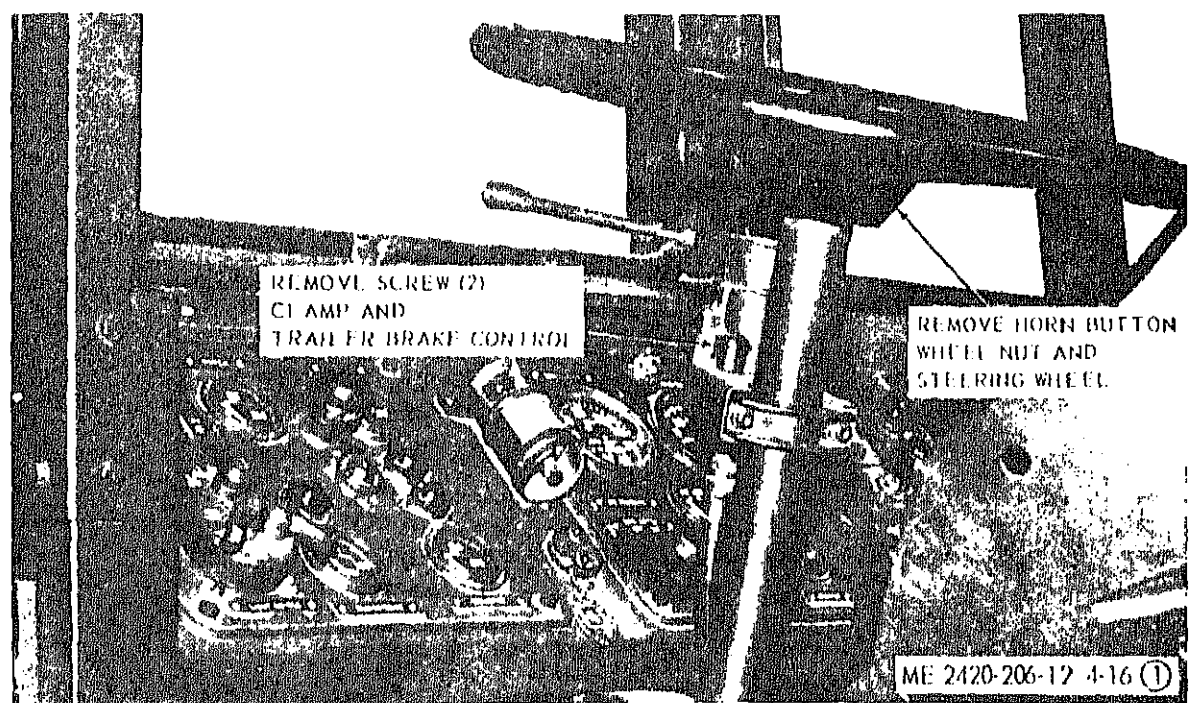


Figure 4-16. Steering wheel, trailer brake control, removal and installation. (sheet 1 of 2).

b. *Cleaning and Inspection.*

- (1) Clean parts and dry thoroughly.
- (2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. *Installation.* Install steering wheel and trailer brake control in reverse order of removal, figure 4-16.

d. *Drag Link Adjustment.*

- (1) Park tractor in a straight direction.
- (2) Remove floorplate beside steering column. Remove nut (2) that secures ball stud (4) of the drag link to the pitman arm (21) of steering gear (22). Disengage ball stud from pitman arm.

(3) With engine off, turn steering wheel gently until it stops at its limit of rotation in either

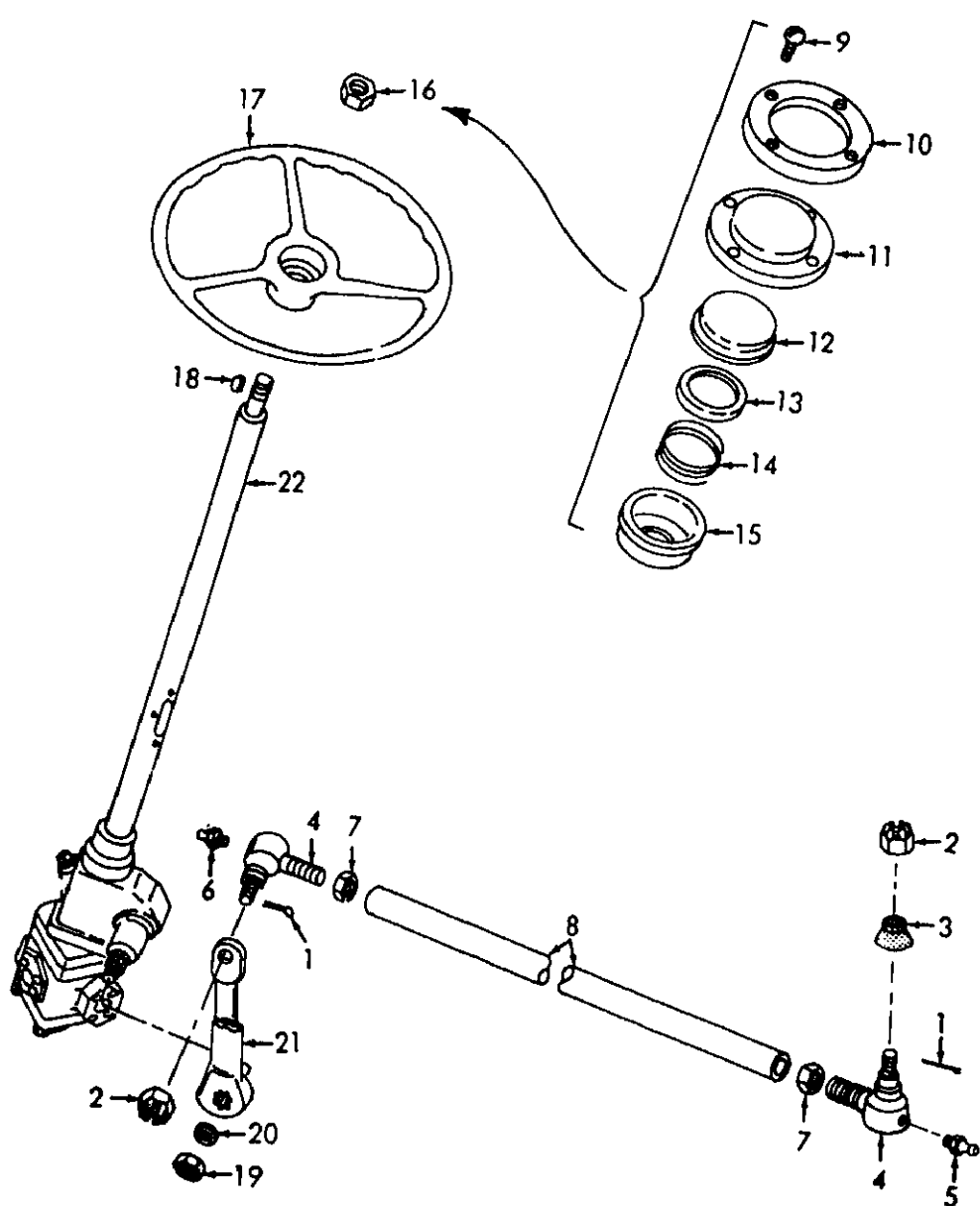
limit of travel in the opposite direction.

(4) When total wheel travel is determined, divide this number by two. Turn wheel backward midposition until it is centered.

(5) Check position of ball stud (4) to mounting hole on pitman arm. If it is not aligned, loosen locknut (7) that locks ball joint to drag link tube (8) and turn ball stud in or out of tube until it is aligned.

(6) If alignment cannot be made by adjusting the positions of ball studs, remove nut (19) and washer (20) and pull pitman arm (21) from steering gear shaft. Reposition pitman arm on the shaft to permit proper adjustment of drag link.

(7) Tighten all locknuts (7) after making



ME 2420-206-12/4-16 ②

- | | |
|-----------------------|-------------------|
| 1 Cotter pin | 12 Horn button |
| 2 Nut | 13 Insulator |
| 3 Rubber boot | 14 Spring |
| 4 Ball stud | 15 Contact |
| 5 Lubrication fitting | 16 Nut |
| 6 Lubrication fitting | 17 Steering wheel |
| 7 Locknut | 18 Key |
| 8 Drag link tube | 19 Nut |
| 9 Machine screw | 20 Washer |
| 10 Retainer | 21 Pitman arm |
| 11 Cap | 22 Steering gear |

Figure 4-16. Steering wheel, trailer brake control, removal and

22. Bulldozer Control Levers

a. Removal and Disassembly.

- (1) Remove floorplate and boot from lever. Remove rear rock guard (fig. 4-46).
- (2) Remove and disassemble bulldozer control levers as illustrated in figure 4-17.

b. Cleaning and Inspection.

- (1) Clean all parts and dry thoroughly.
- (2) Inspect all parts for cracks, breaks and other damage. Replace defective parts as necessary.

c. Reassembly and Installation.

- (1) Reassemble and install bulldozer control levers as illustrated in figure 4-17.

(2) Adjustment.

(a) To adjust bulldozer control lever line so control lever is farther to front when in neutral position, screw rod end (21) farther onto rod. For adjusting to rear reverse above procedure.

(b) To adjust bulldozer control lever line so control lever is farther to the right when in neutral position, screw rod end (14) farther onto rod (15). For adjusting to left, reverse above procedure.

(3) Install rear rock guard (fig. 4-46) and floorplate.

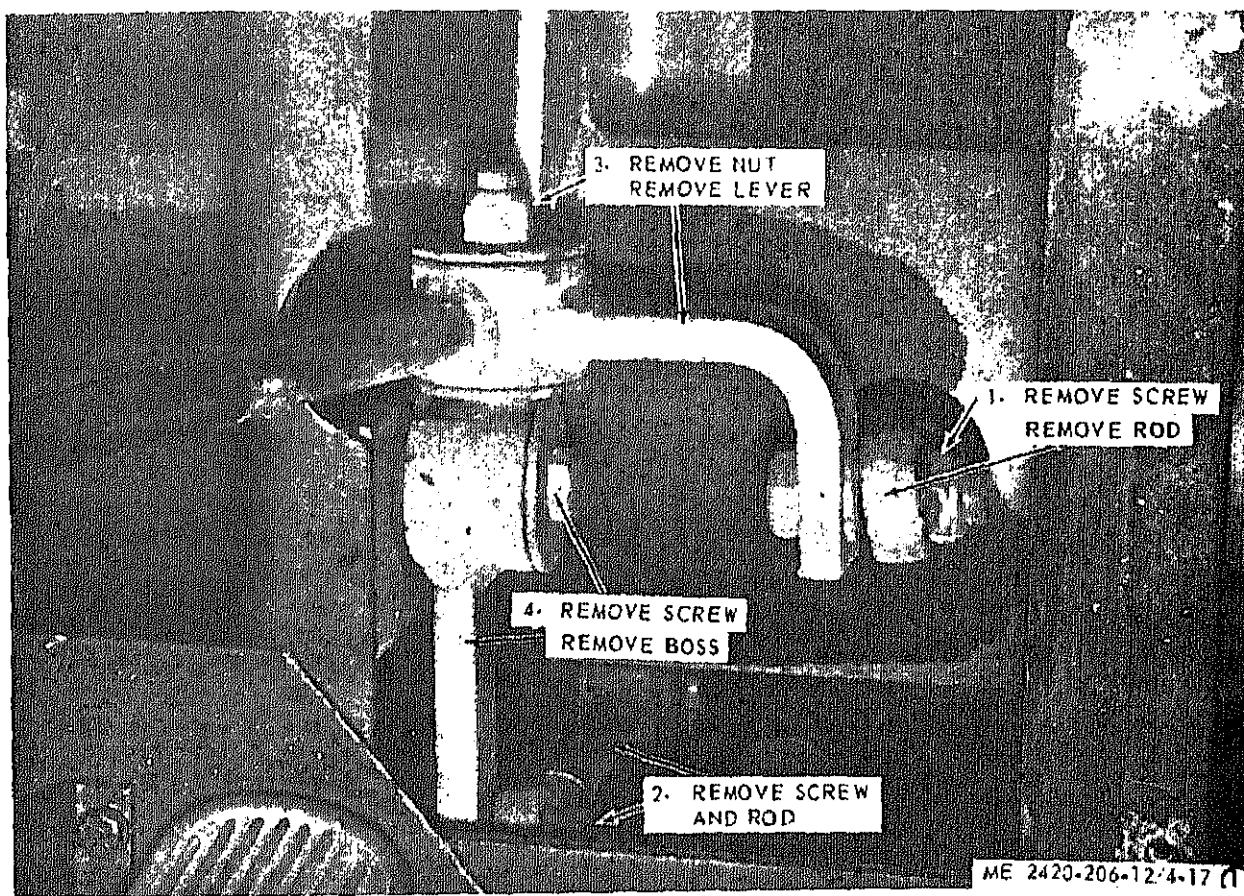


Figure 4-17. Bulldozer control lever, removal, disassembly, reassembly and installation (sheet 1 of 2).

ME 2420-206-12-4-17 (1)

- 3 Rod
- 4 Pin
- 5 Pin
- 6 Clevis
- 7 Jamnut
- 8 Rod
- 9 Pin
- 10 Pin
- 11 Washer
- 12 Nut
- 13 Screw
- 14 Rod end
- 15 Rod
- 16 Pin
- 17 Pin
- 18 Nut
- 19 Washer
- 20 Screw
- 21 Rod end
- 22 Rod
- 23 Screw
- 24 Nut
- 25 Sleeve
- 26 Bushing
- 27 Bellcrank
- 28 Nut
- 29 Washer
- 30 Knob
- 31 Lever
- 32 Sleeve
- 33 Bushing
- 34 Washer
- 35 Screw
- 36 Nut
- 37 Washer
- 38 Bushing
- 39 Sleeve
- 40 Boss
- 41 Washer
- 42 Screw
- 43 Nut
- 44 Shaft
- 45 Bushing
- 46 Tube

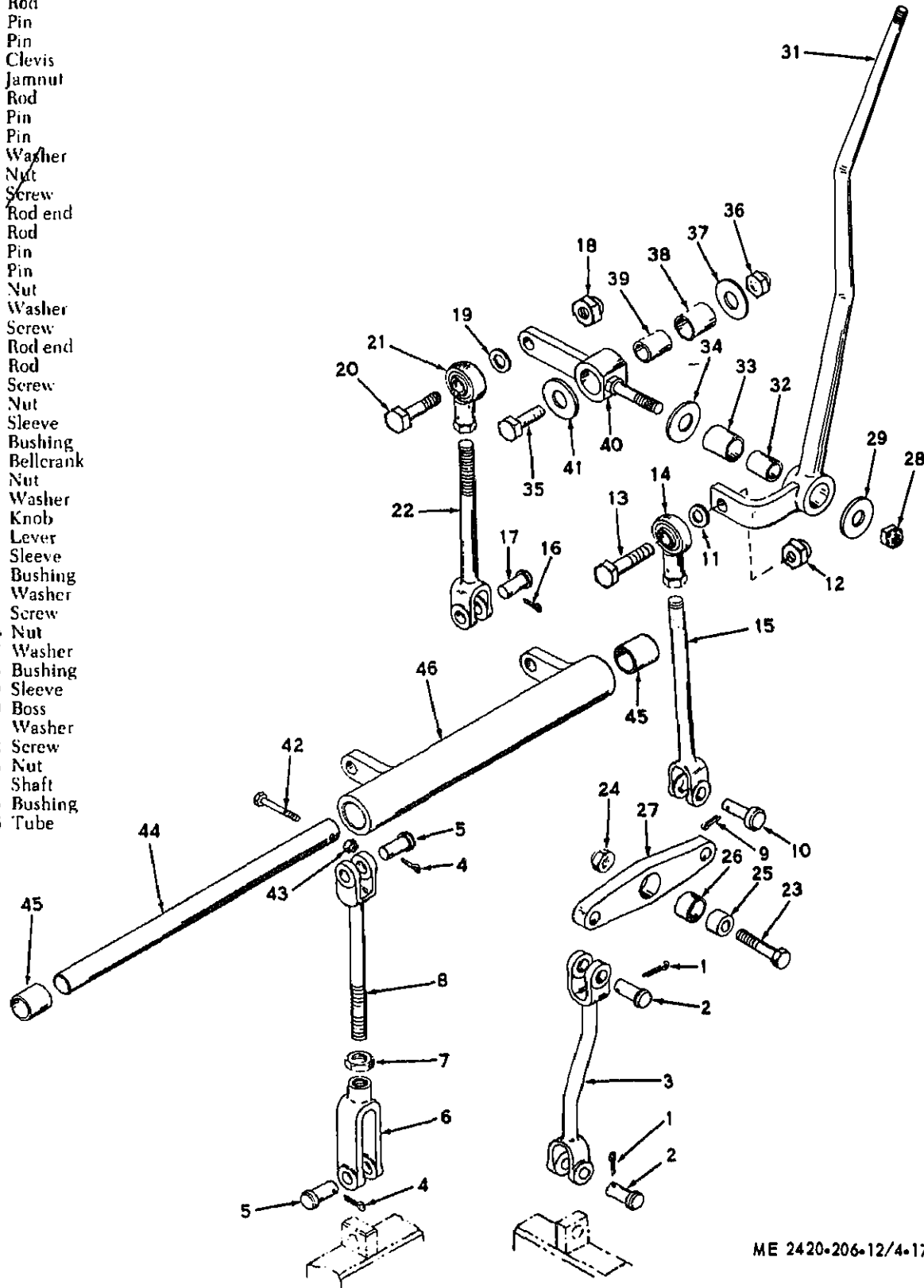


Figure 4-17. Bulldozer controller lever removal/disassembly: necessary

23. Transmission Control Levers

a. Removal and Disassembly.

- (1) Remove floorplates.
- (2) Remove and disassemble transmission control levers as illustrated in figure 4-18.

b. Cleaning and Inspection.

- (1) Clean parts and dry thoroughly.
- (2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. Reassembly and Installation.

- (1) Reassemble and install transmission control levers as illustrated in figure 4-18.

- (2) The speed and direction settings of spools transmission control valve must coincide with numbers on shift cover. Adjust as follows:

(a) With transmission shift lever (50) in N (neutral) position, check that lever is centered in neutral position slot on shift cover (20). To move lever toward operator's position, loosen jamnut (4) and turn to disconnect the direction shift clevis rod (6) from transmission control valve spool. Turn clevis rod into clevis (3) to shorten the linkage. To move lever away from operator's position, reverse above procedure. Tighten jamnut and reconnect clevis rod with clevis pin (2) and cotter pin (1).

(b) After adjustment, shift lever to forward and reverse positions to make sure the shift lever is centered in speed range slots on shift cover.

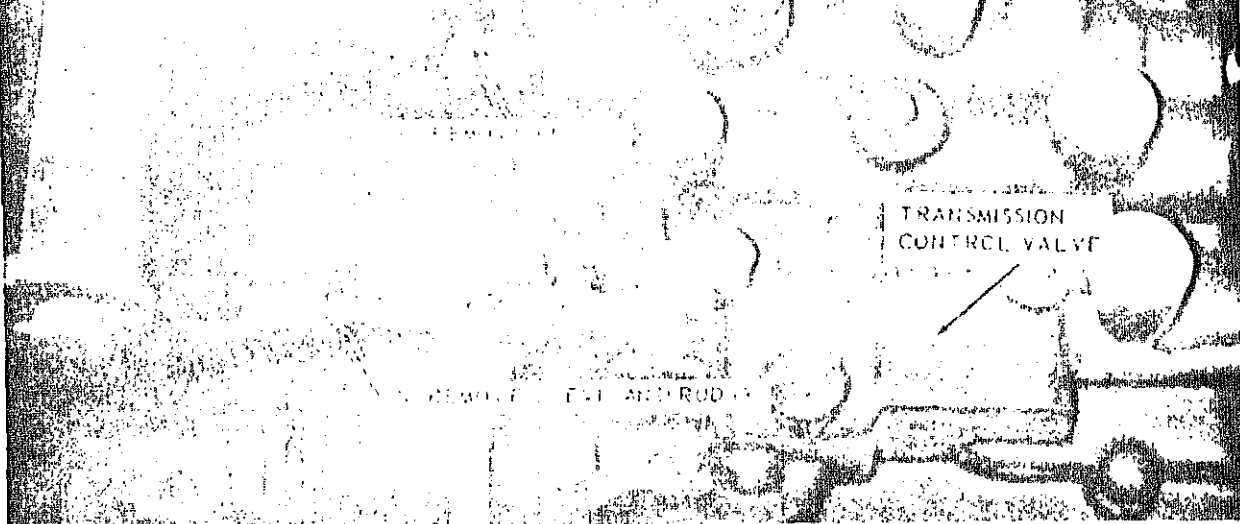
(c) Make sure the speed range spool of trans-

mission control valve is detented in first speed position when lever is shifted to that position. If lever is not properly aligned with number 1 on shift cover, adjust length of speed control linkage. To move lever farther forward, loosen jamnut (4) and disconnect speed shift clevis rod (5) from spool of transmission control valve. Turn clevis rod in to shorten linkage. To move lever farther toward rear, turn clevis rod out of clevis to lengthen linkage. Connect with clevis pin (2) and cotter pin (1).

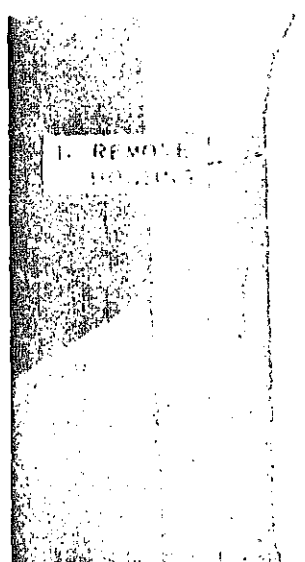
(d) Move shift lever to the fourth speed position. Make sure spool is detented in fourth speed position and lever is aligned with number 4 on shift cover (20). Readjust if necessary.

(e) Move transmission shift lever to N position. Apply parking brake. When brake is applied, brake and shift interlock lever (16) must engage notch in direction shift bellerank (57). If it does not, adjust position of cable spring anchor (10) to move parking brake cable so interlock lever does engage bellerank. With transmission cover valve spool in neutral, if interlock lever (16) does not engage bellerank, adjust effective lengths of the direction shift rod (39) and direction shift clevis rod (6) if necessary. When adjusted, the spring (7) should be under moderate tension. Release the brake. Check distance between top of cable spring anchor and underside of floorplate. It should be approximately 1 7/8 inches.

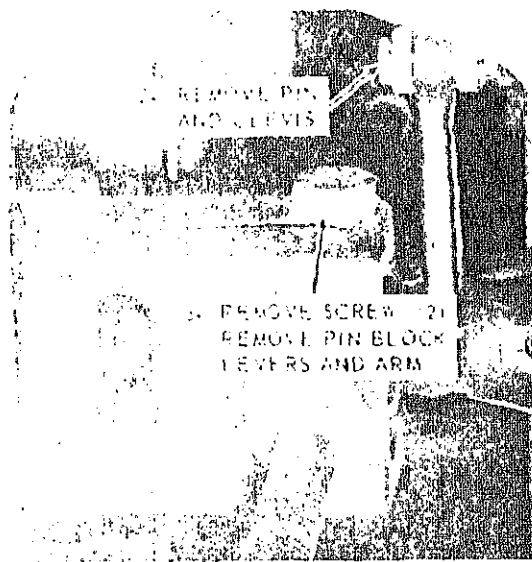
(3) Install floorplate.



A. SPOOL CONTROL LEVER



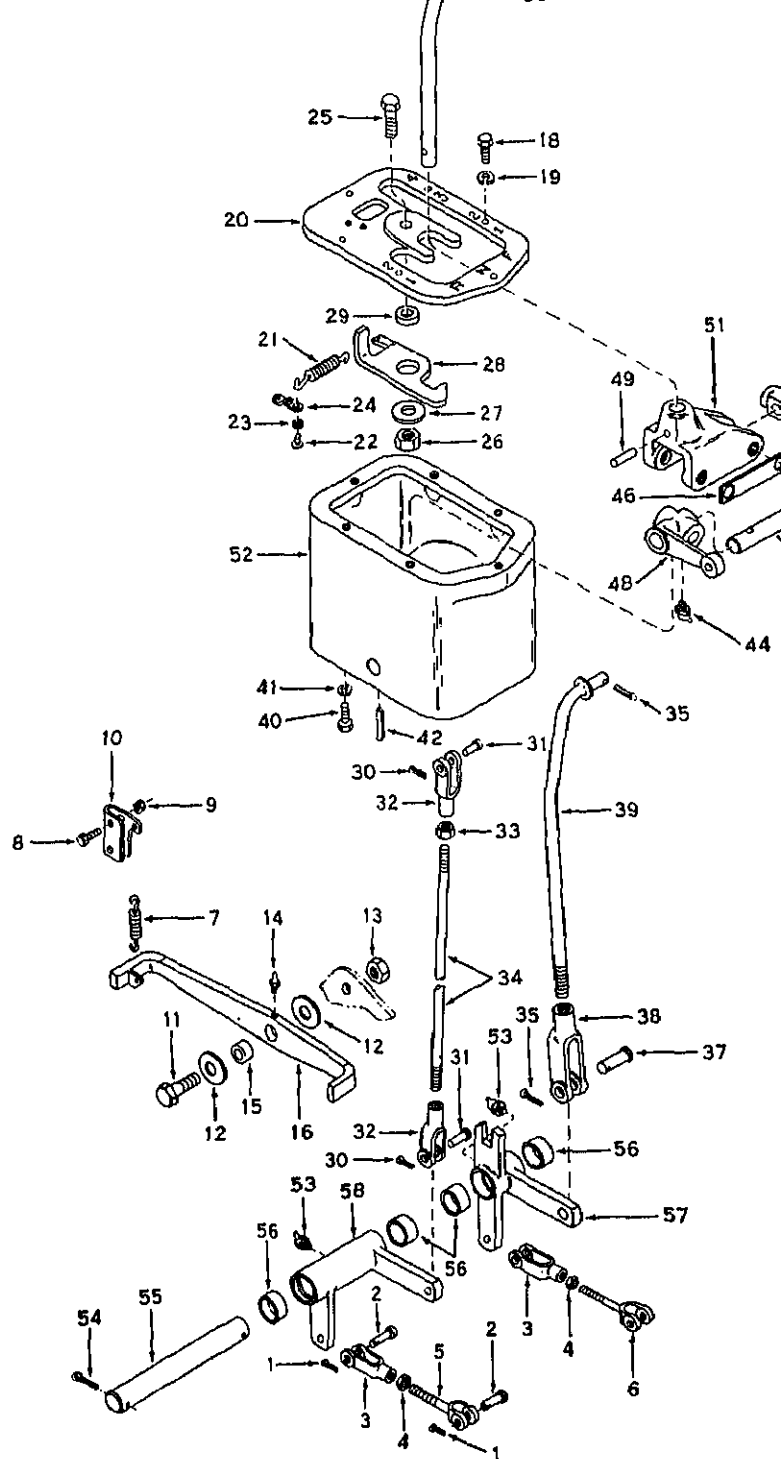
B. OPERATION LEVER



ME 2420-206-12 4-18 ①

Figure 4-18. Transmission control levers, removal, disassembly, reassembly and installation (sheet 1 of 2).

- 4 Jammer
- 5 Rod
- 6 Rod
- 7 Spring
- 8 Screw
- 9 Nut
- 10 Spring anchor
- 11 Screw
- 12 Washer
- 13 Nut
- 14 Fitting
- 15 Bushing
- 16 Lever
- 17 Knob
- 18 Screw
- 19 Washer
- 20 Cover
- 21 Spring
- 22 Screw
- 23 Washer
- 24 Spring tab
- 25 Screw
- 26 Nut
- 27 Washer
- 28 Plate
- 29 Bushing
- 30 Pin
- 31 Pin
- 32 Clevis
- 33 Nut
- 34 Rod
- 35 Pin
- 36 Washer
- 37 Pin
- 38 Clevis
- 39 Rod
- 40 Screw
- 41 Washer
- 42 Pin
- 43 Pin
- 44 Fitting
- 45 Screw
- 46 Tab
- 47 Block
- 48 Arm
- 49 Pin
- 50 Lever
- 51 Lever
- 52 Housing
- 53 Fitting
- 54 Pin
- 55 Shaft
- 56 Bushing
- 57 Bellerank
- 58 Bellerank



ME 2420-20

Figure 4-18. Transmission control levers, removal, disassembly, reassembly and installation (sheet 2 of 2).

4-24. Parking Brake Hand Lever and Cable

a. Removal.

- (1) Remove rock guard (para 4-58).
- (2) Remove parking brake hand lever assembly and cable as illustrated in figure 4-19.

b. Cleaning and Inspection.

- (1) Clean parts and dry thoroughly.
- (2) Inspect for cracks, breaks and other damage. Replace damaged or defective parts as necessary. Lubricate cable with light oil.

c. Installation and Adjustment.

- (1) Install parking brake hand lever and cable as illustrated in figure 4-19.

(a) Rotate adjustment knob clockwise to correct cable tension pressure on brake shoe. If adjustment cannot be corrected, rotate counterclockwise and remove cotter and clevis pins that secure lower end of parking brake cable to oper-

ating lever. Reconnect cable with cotter pins and readjust as directed above.

(b) To adjust brake shoe remove cotter pins from parking brake operating lever. Rotate eccentric adjuster in direction of free brake drum rotation until adjustment end of shoe contacting the eccentric is within 0.010 inch of drum surface, when measured by feeler gages inserted from open end of shoe.

(c) Expand brake shoes by turning adjustment star wheel with a screwdriver inserted through hole in drum.

(d) Repeat adjustment until adjustment end of lining on other shoe is within 0.010 inch of drum surface.

(e) Install brake cable.

- (2) Install rock guard (para 4-58).

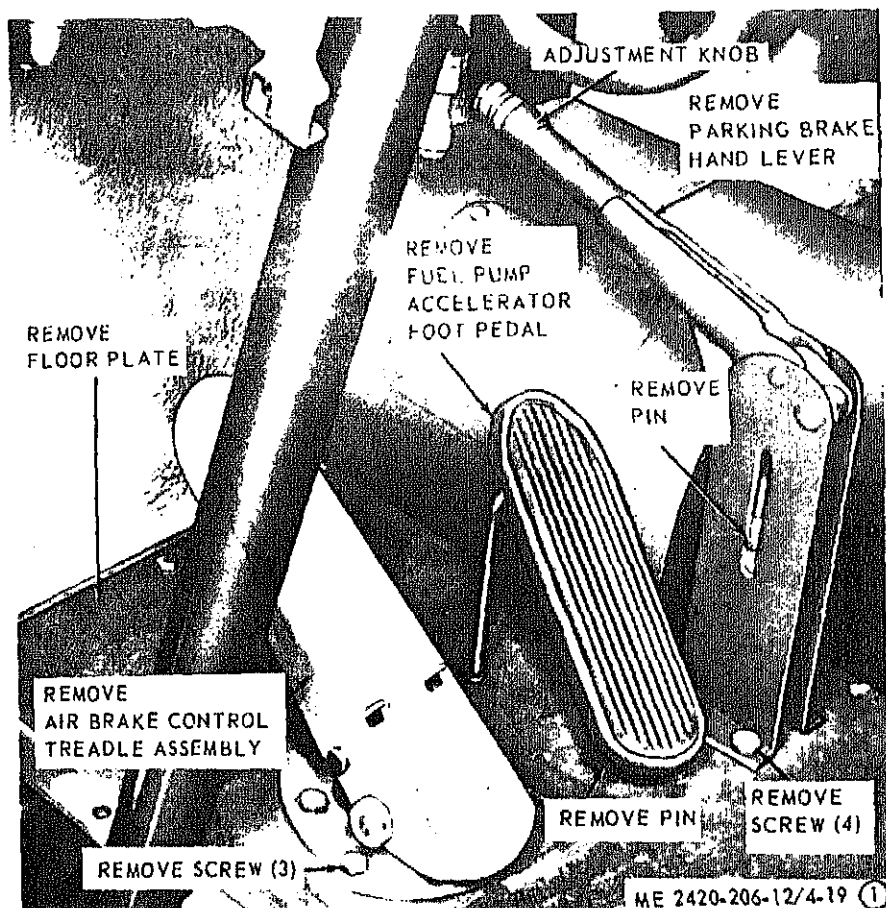


Figure 4-19. Parking brake hand lever and cable, removal and installation (sheet 1 of 2).

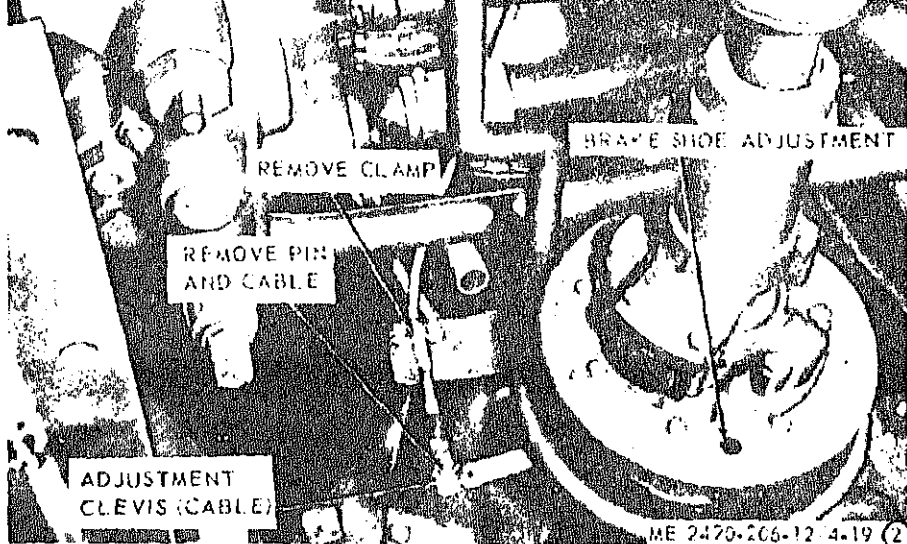


Figure 19. Parking brake hand lever and cable, removal and installation (sheet 2 of 2).

4-25. Accelerator Pedal and Linkage

a. Removal and Disassembly. Remove and disassemble accelerator pedal and linkage as illustrated in figure 4-20.

b. Cleaning and Inspection.

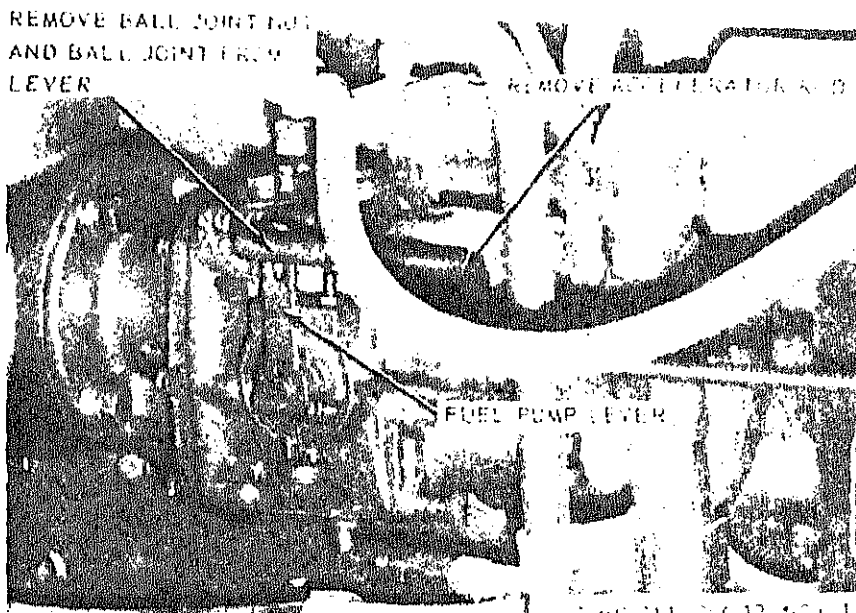
- (1) Clean parts and dry thoroughly.
- (2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

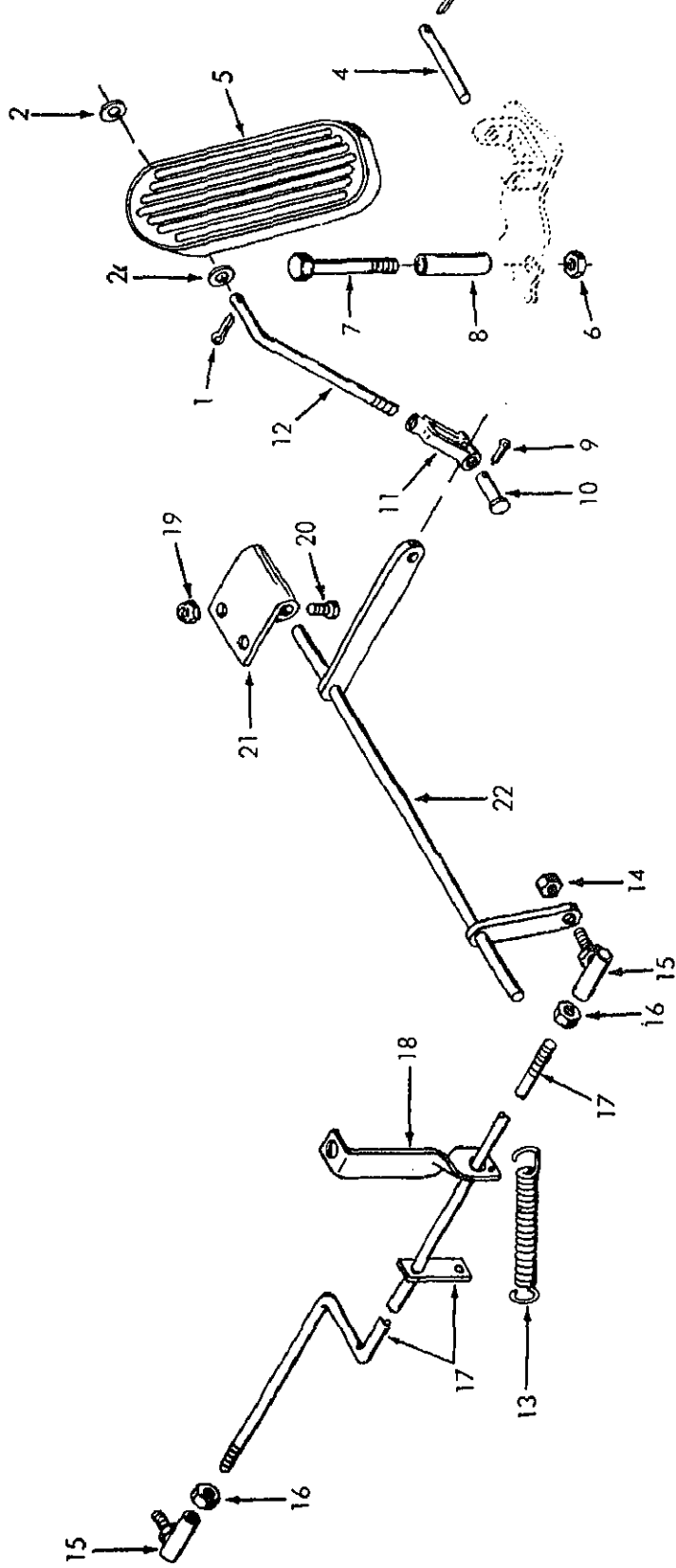
c. Reassembly and Installation. Reassemble and install as illustrated in figure 4-20.

d. Adjustment.

(1) Adjust ball joints to correct operation of linkage. Position accelerator pedal by adjusting clevis (11) on rod (12).

(2) Adjust pedal stop screw to correct position on pedal.





ME 2420-206-12/4-20

- | | |
|-----------|---------------|
| 1 Pin | 12 Rod |
| 2 Washer | 13 Spring |
| 3 Pin | 14 Nut |
| 4 Pedal | 15 Ball joint |
| 5 Nut | 16 Nut |
| 6 Screw | 17 Rod |
| 7 Stop | 18 Guide |
| 8 Pin | 19 Nut |
| 9 Pin | 20 Screw |
| 10 Pin | 21 Plate |
| 11 Clevis | 22 Bellcrank |

Figure 4-20. Accelerator pedal and linkage, removal, disassembly, reassembly, and installation (sheet 2 of 2).

26. General

Engine coolant, electrical, oil and fuel components listed herein are attached on or near the engine block.

27. Starter and Solenoid

a. Testing. With battery fully charged and main switch in the ON position, press starter switch. The starting motor should smoothly turn over engine at a sufficient rate of speed to cause starting without unusual noise or vibration. Check all electrical leads before removing starter and solenoid if starter fails to turn over engine.

Note. Remove cable from battery terminal before removing starter.

b. Removal. Remove starter as illustrated in figure 4-21. Match mark the end bell frame (3), starter motor housing (55), lever housing (28), and drive housing (21) to assure proper reassembly.

c. Cleaning, Inspection and Test.

(1) Clean starter and solenoid with a clean cloth.

(2) **Inspection.**

(a) Inspect brushes (17) for wear and broken springs (18) for distortion or weakness. Replace brushes if worn to less than half their original length. Spring tension should be 80 ounces minimum with brushes installed.

(b) Inspect motor drive clutch (23) for cracked, chipped, or broken gear teeth, or other defects.

(c) Inspect plunger assembly (41) for damage.

(d) Inspect all items removed for cracks, breaks and other damage. Repair or replace items 4, 8, 10, 13, 14, 17, 18, 22, 24, 25, 29, 30, 42, 47, and 49 which are in the repair kit. Turn armature shaft by hand to assure it rotates freely. Replace defective starter, solenoid, and cables.

d. Installation. Install starter and solenoid as illustrated in figure 4-21. Replace gasket.

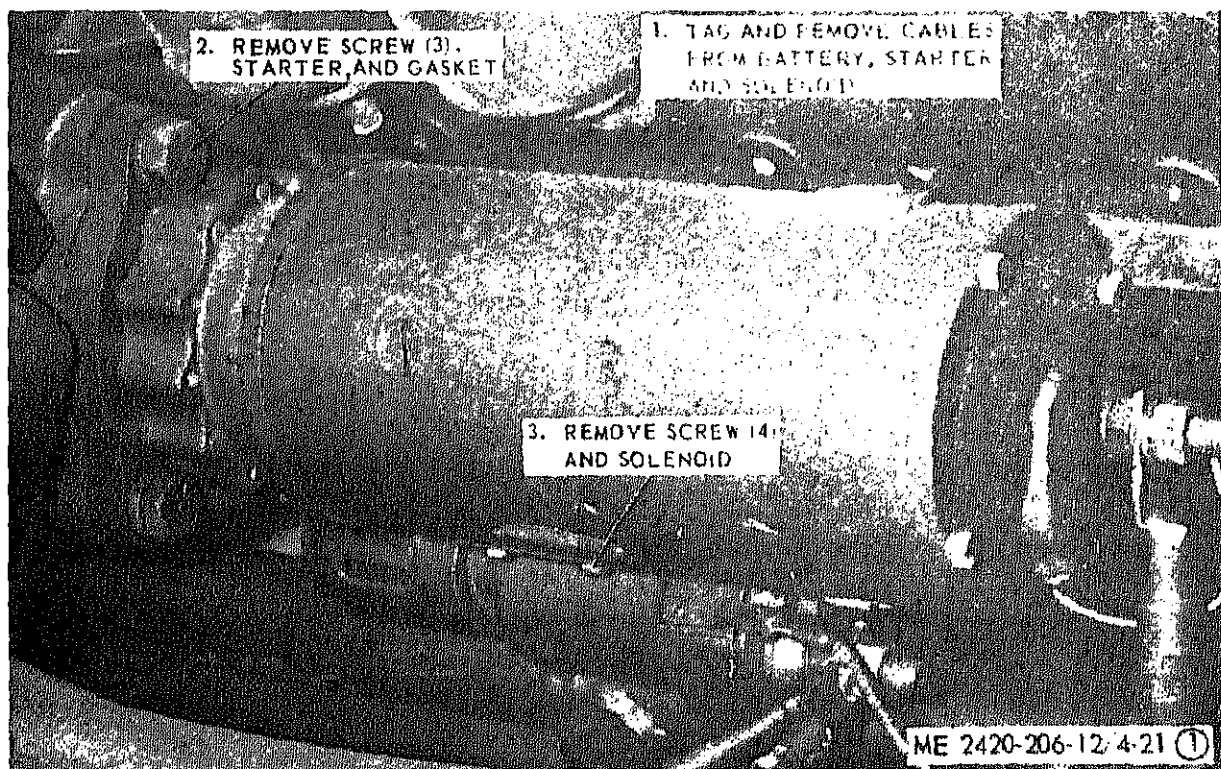
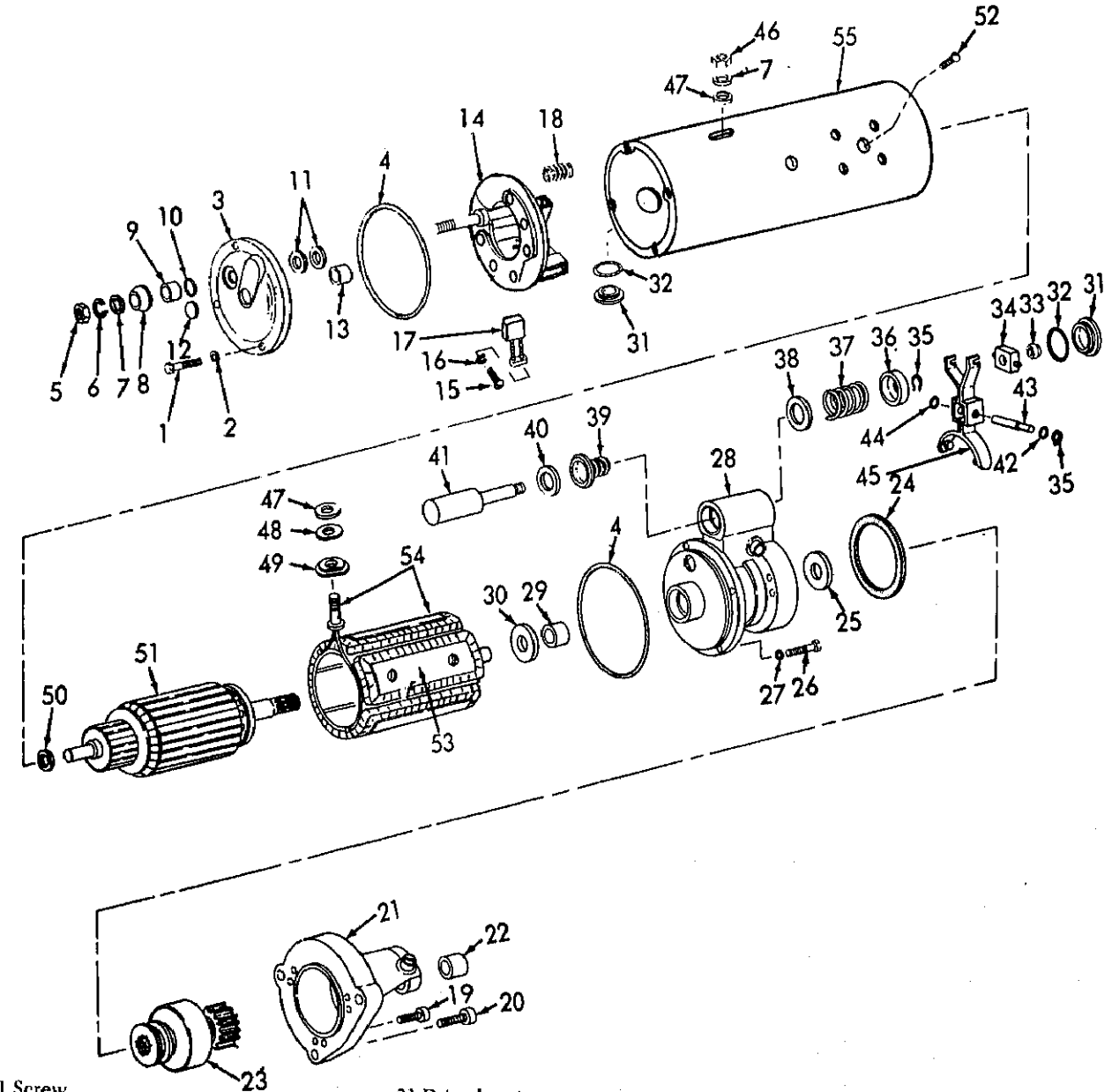


Figure 4-21. Starter and solenoid, removal, disassembly, reassembly, and installation (sheet 1 of 2).



1 Screw
 2 Washer
 3 End bell frame
 4 Ring
 5 Nut
 6 Washer
 7 Washer
 8 Insulator
 9 Bushing
 10 Packing
 11 Washer
 12 Plug
 13 Bearing
 14 Brush holder assembly
 15 Screw
 16 Washer
 17 Brush
 18 Brush spring
 19 Bolt

21 Drive housing
 22 Bushing
 23 Motor drive clutch
 24 Gasket
 25 Washer
 26 Bolt
 27 Washer
 28 Lever Housing
 29 Bearing
 30 Washer
 31 Plug
 32 Gasket
 33 Nut
 34 Plunger guide
 35 Ring
 36 Retainer
 37 Spring
 38 Retainer

41 Plunger assembly
 42 Packing
 43 Shaft
 44 Packing
 45 Shift lever assembly
 46 Nut
 47 Washer
 48 Gasket
 49 Insulator
 50 Washer
 51 Armature
 52 Screw
 53 Shoe pole

ME 2420-206-12/4-21 (2)

(2) Inspect brush holders, springs and brushes for cracks, breaks, wear, distortion and other damage. Brushes should move freely in their holders. Replace damaged or defective parts as necessary.

(a) Remove screw and lockwasher that secure brush leads to holder.

(b) Lift brush arm that retains brush in holder; remove brush.

(c) To replace, reverse above procedure.

(3) If commutator segment wear and excessive heat burns cannot be corrected with emery cloth application to segments, replace generator assembly.

b. Removal of Generator Drive Belt.

(1) Remove generator drive belt as illustrated in figure 4-22.

move lower capscrow (4) and its lockwasher, capscrow (13), flat washer, lockwasher, and nut.

(c) Loosen capscrows (6) and (10) that secure generator adjusting strap and loosen nut (11) secures generator (12) to the frame; push generator towards frame to loosen generator drive belt.

(d) Slide fan blade, fan hub, and fan bracket (3) forward until space between water pump fan bracket is adequate to remove generator fan belts.

c. Cleaning and Inspection of Generator Drive Belt.

(1) Clean generator drive belt with a clean cloth.

(2) Inspect belt for cracks, missing belt teeth or other damage. Replace as necessary.

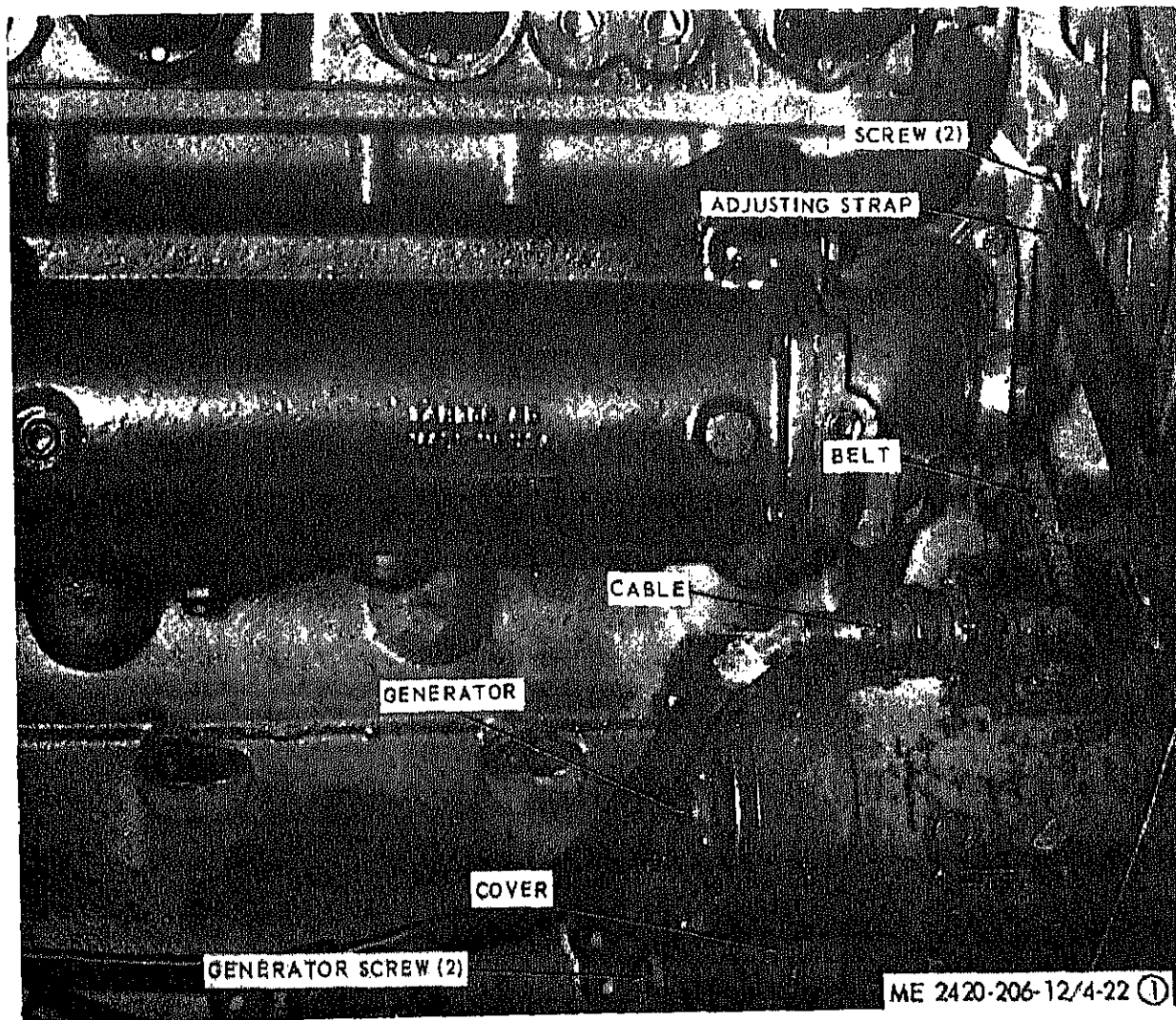


Figure 4-22. Generator repair, removal and installation (sheet 1 of 2).

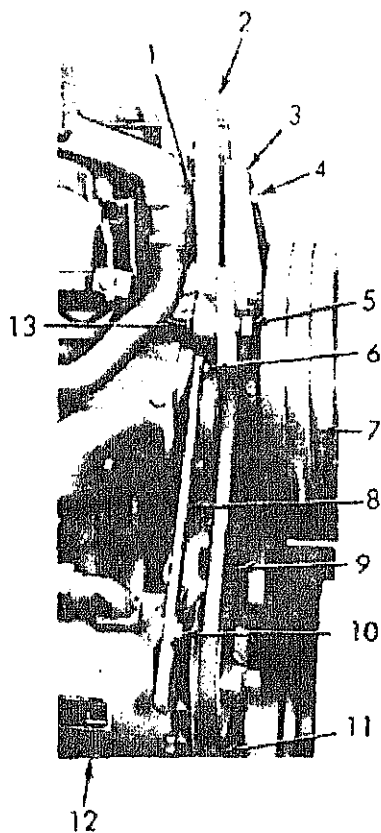
generator belt in reverse order of removal.

e. Belt Tension Adjustment.

(1) Loosen adjusting strap and generator screws and move generator away from engine to apply tension on belt.

(2) Secure adjusting strap and generator screws when tension deflection of 1 inch is indicated by depressing belt with fingers midway between pulleys.

(3) Correct generator belt tension after correcting water pump belt tension (para 4-38).



ME 2420-206-12/4-22 (2)

Fan bracket adjusting block
Adjusting screw
Fan bracket
Cap screw
Nut
Cap screw
Fan belt

8 Adjusting strap
9 Generator drive belt
10 Cap screw
11 Nut
12 Generator
13 Cap screw

Figure 4-22. Generator, repair, removal and installation, (sheet 2 of 2).

f. Removal of Generator.

(1) Remove generator drive belt as directed

in para 4-38. Remove generator by loosening adjusting strap (8) and two cap screws, lockwashers, and nuts (11) that secure generator to bracket; remove generator.

g. Cleaning and Inspection of Generator.

(1) Clean exterior of generator and dry thoroughly.

(2) Inspect generator as directed in *a* above. Rotate generator armature shaft manually to assure it rotates freely. Inspect for overheating and burn insulation.

(3) Inspect all parts for cracks, wear or other damage; replace as necessary.

h. Installation of generator.

(1) Install generator in reverse order of removal.

(2) Install generator drive belt as directed in *d* above.

(3) Polarize generator as directed in *i* below.

i. Generator Polarizing.

(1) Polarize generator before starting engine whenever generator cable has been removed from generator.

(2) Disconnect generator-to-voltage regulator cable at voltage regulator, and battery connection cable from voltage regulator; momentarily connect a wire from the B terminal of generator cable to battery connection cable.

(3) Install cable.

4-29. Generator Regulator

a. Description. The generator regulator is a voltage-tight, radio-suppressed, corrosion and fungus-resistant unit designed for use with a generator having an internally grounded field circuit, and a system with a negative ground. The regulator is composed of three units, a cutout relay, voltage regulator, and current regulator. The cutout relay closes the circuit to the batteries. The voltage regulator regulates the generator output to the batteries within preset limits. The current regulator regulates the amount of current being delivered to the batteries.

b. Testing. When ammeter on instrument panel indicates:

(1) High charging rate with fully charged battery. (If temperatures are high, the battery normally accept a high rate of charge. If operating condition is not due to high temperatures, perform the following checks:)

speed. If output remains high, the generator or wiring is at fault. If no output is obtained, remove generator regulator for adjustment or refer to direct support maintenance for repair.

(2) Low or no charging rate with low battery.

(a) Check for loose connections, frayed or damaged wires.

(b) Check battery (para 4-59).

(c) Insert testing harness, fig 4-23, in generator regulator circuit. Operate generator regulator at medium speed and (battery connected) momentarily connect T-3 to T-1 (armature) and increase generator speed. If output does not increase, check generator. If output increases, remove generator regulator for adjustment or refer to direct support maintenance for repair.

c. *Removal.* Remove defective, damaged, generator regulator as illustrated in figure 4-23. Tape ends of cables to avoid short circuiting.

d. *Installation.* Install new generator regulator in reverse order of removal.

Note. Polarize generator before cranking engine (para 4-28i).

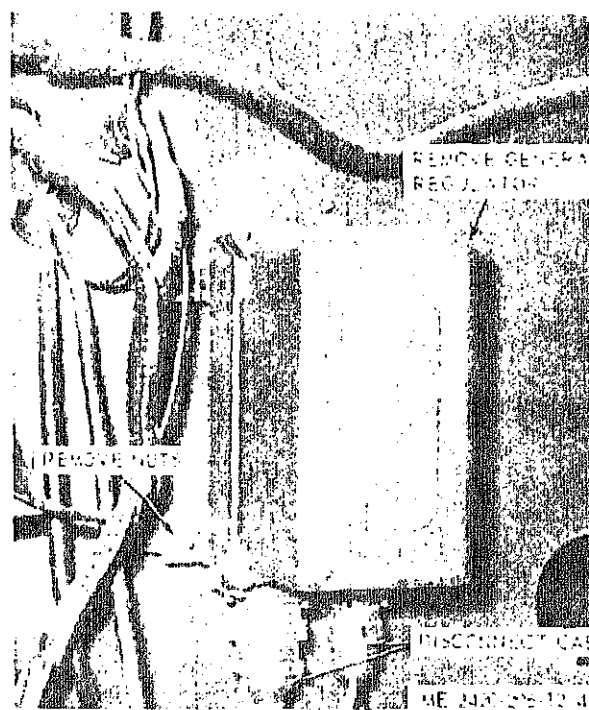


Figure 4-23. Generator regulator, testing, removal and installation (sheet 1 of 2).

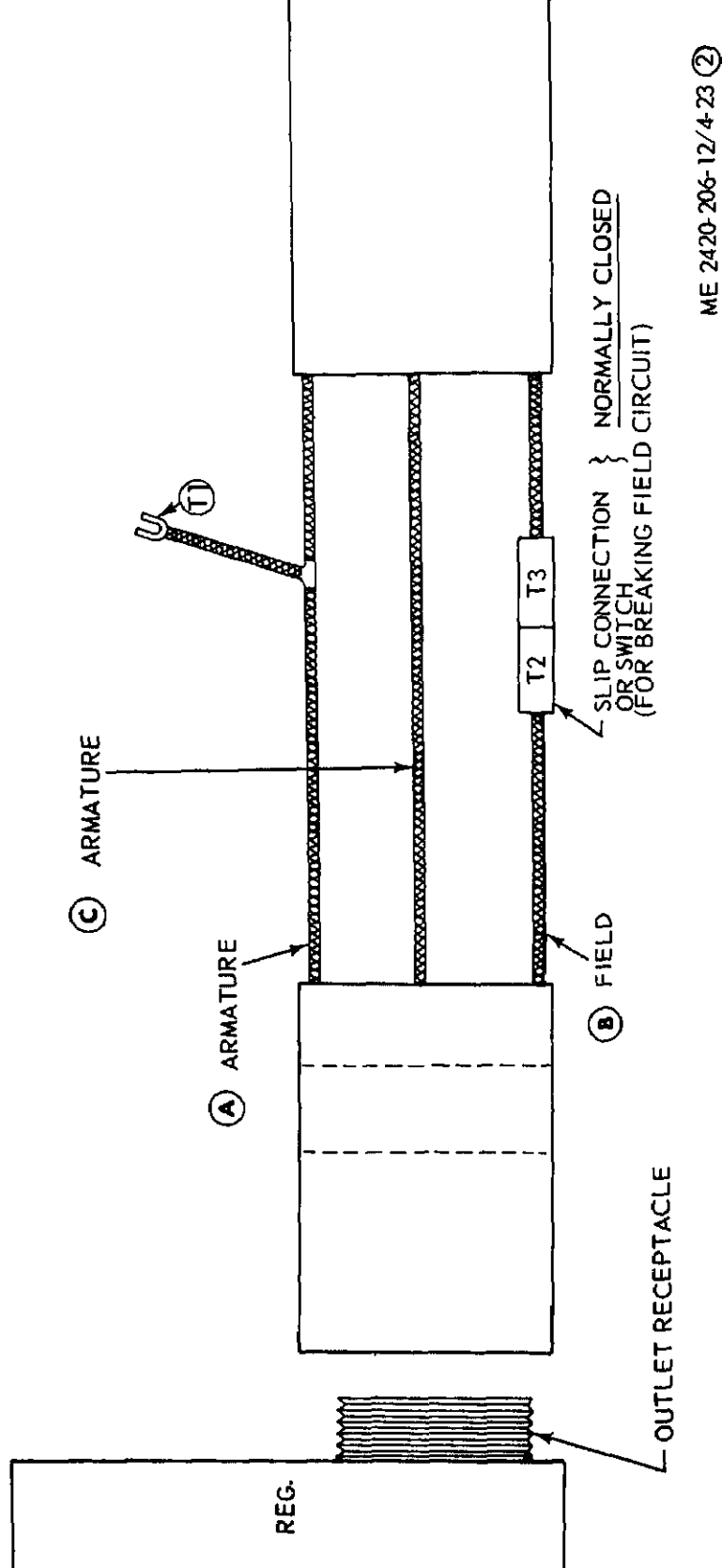


Figure 4-23. Generator regulator, testing, removal and installation (sheet 2 of 2).

30. Coolant Thermostat

Note. Replace coolant thermostat when temperatures of 10°F to 195°F cannot be maintained during normal operation of tractor.

a. Removal. Remove thermostat as illustrated in figure 4-24.

b. Cleaning and Inspection.

(1) Clean thermostat housing and parts with a

cooling system flushing solution.

(2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. Test. Thermostat should open fully when immersed in water heated to 200°F . Replace a defective thermostat.

d. Installation. Install thermostat in reverse order of removal; replace gasket, fill radiator.

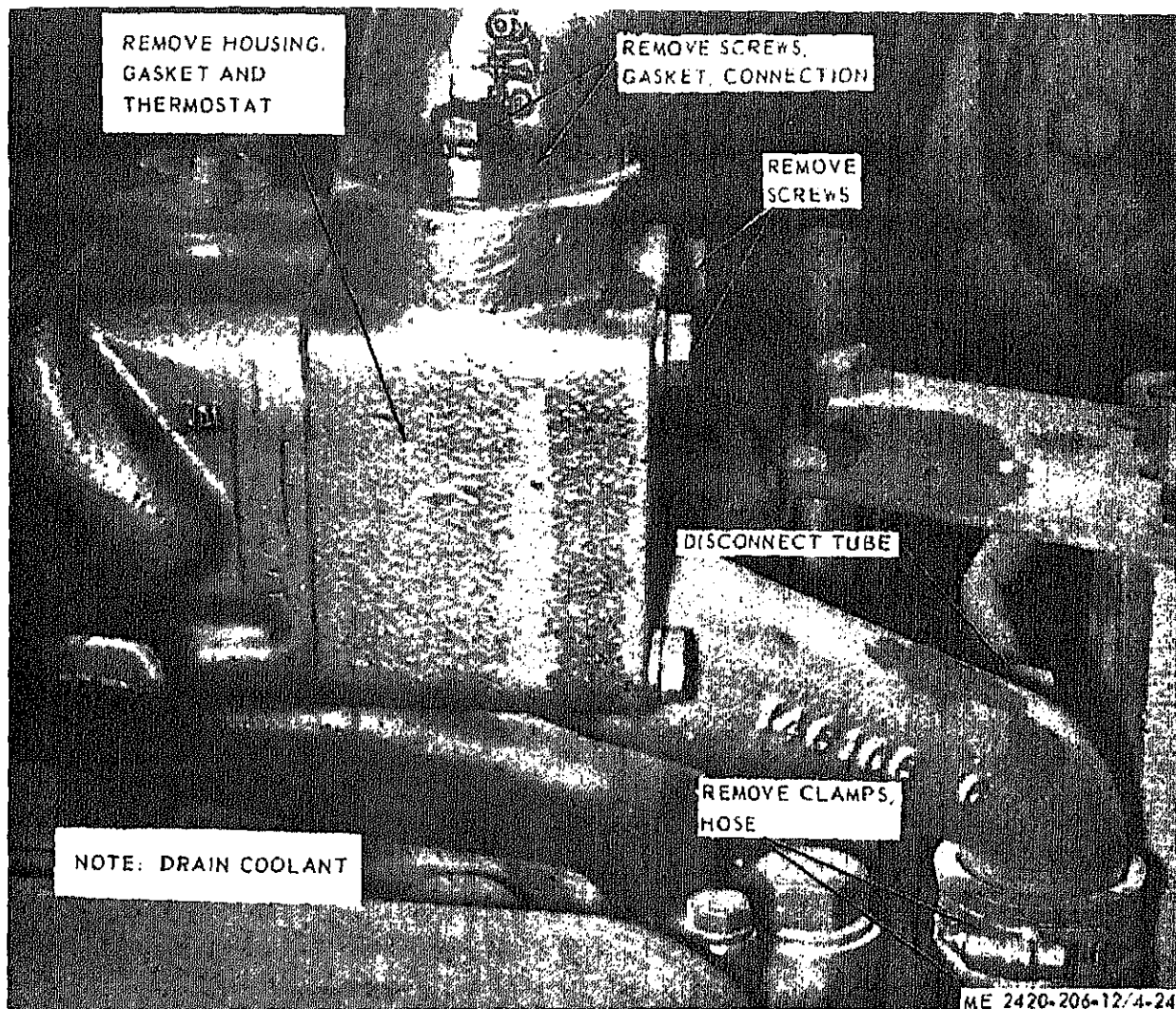


Figure 4-24. Coolant thermostat, removal and installation.

31. Water Filter (Corrosion Resister)

c. Installation. Install water filter in reverse order

(2) Inspect for cracks, breaks and damage.
Replace defective head and lines.

c. Installation.

(1) Install filter heads as illustrated in figure 4-25.

(2) Install elements (para 3-5).

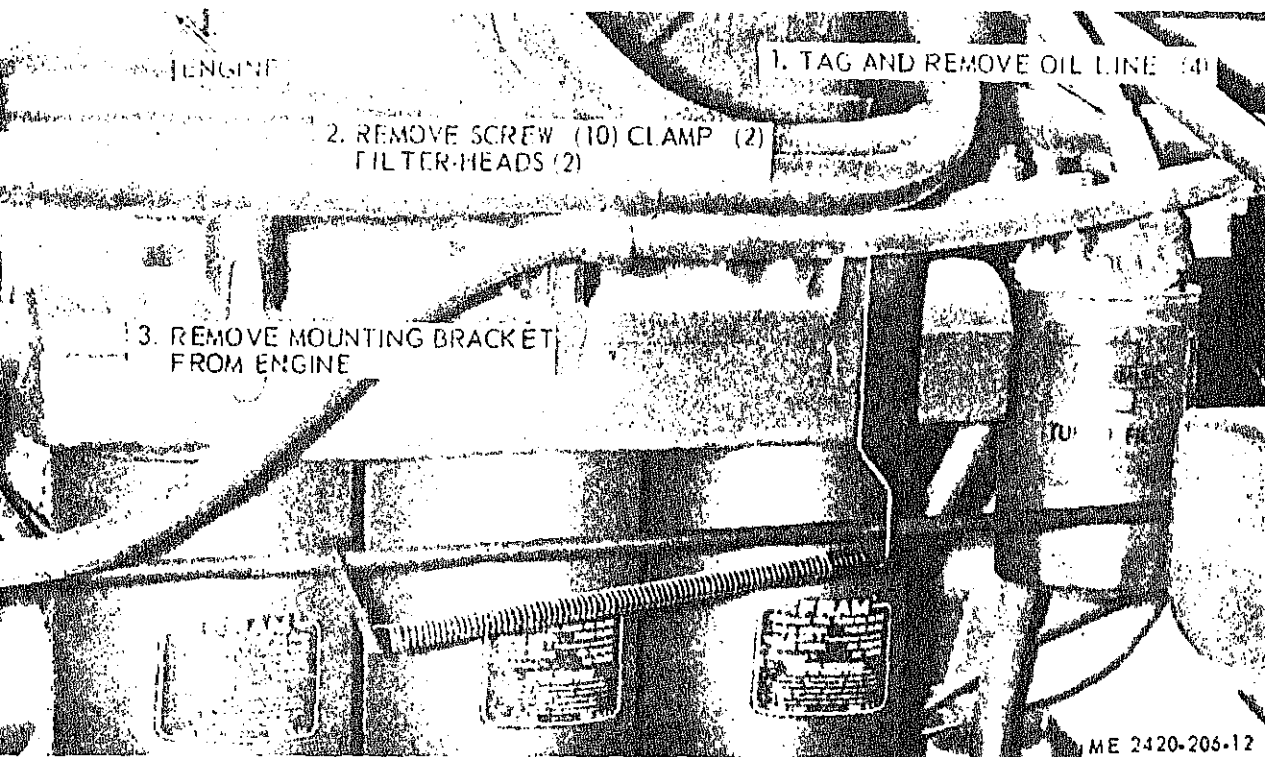


Figure 4-25. Engine and turbocharger filter head, removal and installation.

33. Fuel Filter Head

a. Removal.

- (1) Remove elements (para 3-6).
- (2) Remove filter head as illustrated in figure 4-26.

b. Cleaning and Inspection.

- (1) Clean head and dry thoroughly.

(2) Wipe lines with a cloth.

(3) Inspect for cracks, breaks and other damage. Replace defective head and lines as necessary.

c. Installation.

(1) Install filter heads as illustrated in figure 4-26.

(2) Install elements (para 3-5).

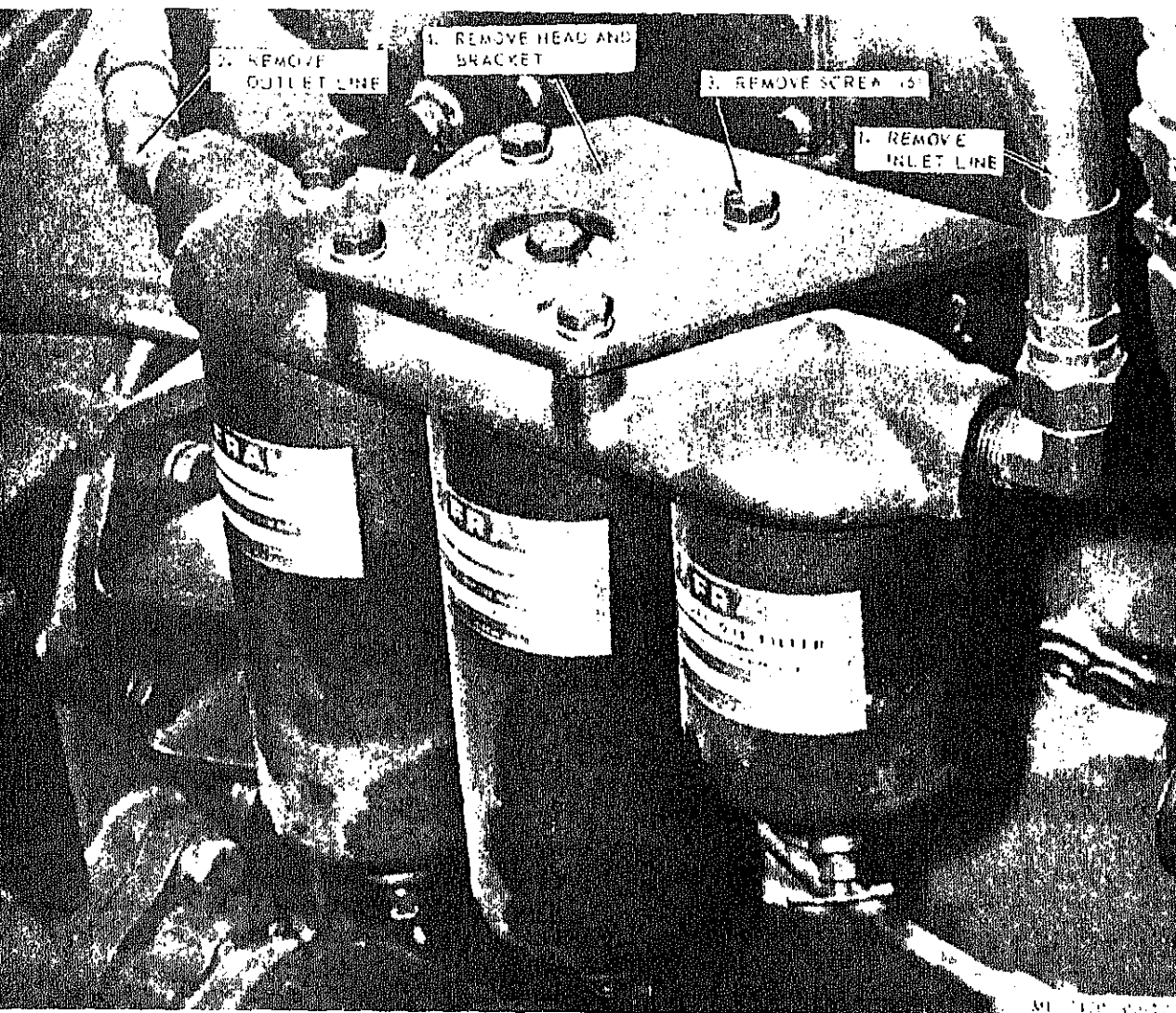


Figure 4-26. Fuel filter head, removal and installation.

34. Fuel Shut Down Valve

a. Removal and Disassembly.

- (1) Tag and disconnect electrical leads.
- (2) Remove governor speed and tachometer cables.
- (3) Remove and disassemble fuel shut down valve as illustrated in figure 4-27.

b. Cleaning and Inspection.

- (1) Clean parts and dry thoroughly. Clean lines and cables. Replace and lubricate preformed packings.
- (2) Inspect for wear and damage.

age. Apply 24 volts DC across terminals of assembly and check magnetic attraction at inner face of coil assembly with a screwdriver blade. With power applied, it should exert a strong magnetic force. Replace a defective fuel shut down valve if necessary.

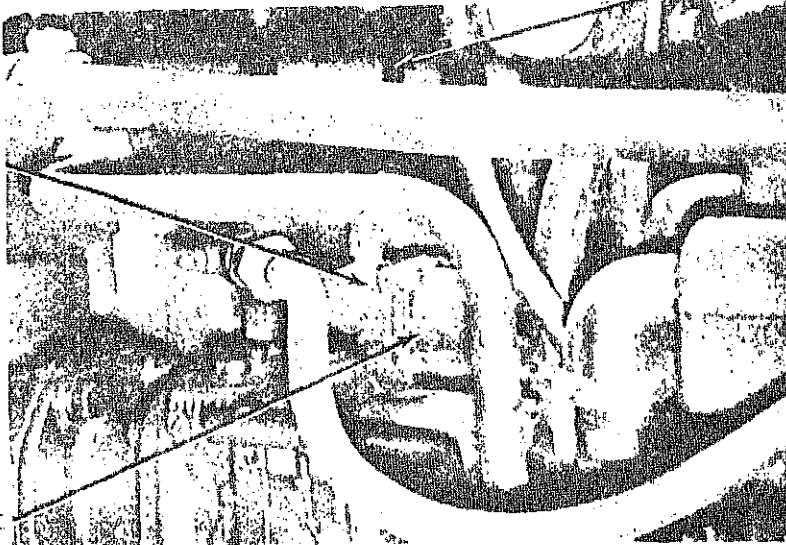
c. Reassembly and Installation.

- (1) Reassemble and install fuel shut down valve as illustrated in figure 4-27.
- (2) Install governor speed and tachometer cables.

REMOVE FUEL LINE (2)

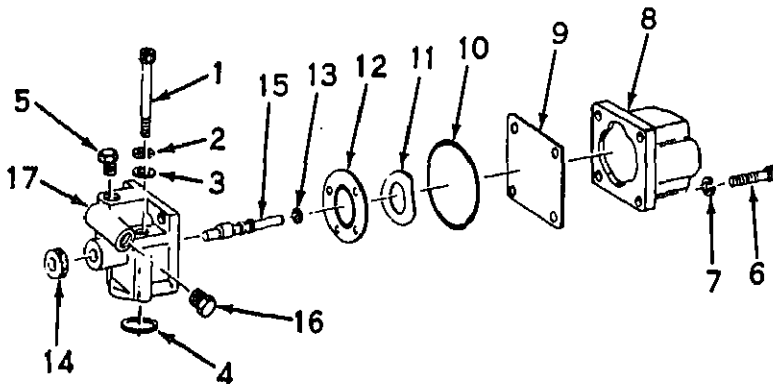
REMOVE SCREW (2)

REMOVE FUEL
SHUT DOWN VALVE



ME 2420-206-12 4-27 ①

Figure 4-27. Fuel shut down valve, removal, disassembly, reassembly, and installatton (sheet 1 of 2).



ME 2420-206-12/4-27 ②

- 1 Capscrew
- 2 Lockwasher
- 3 Flat washer
- 4 Preformed packing
- 5 Connection
- 6 Capscrew
- 7 Lockwasher

- 10 Preformed packing
- 11 Spring
- 12 Valve
- 13 Preformed packing
- 14 Knob
- 15 Shaft
- 16 Pin

4-35. Aneroid

a. *Description.* The aneroid provides a fuel bypass system that responds to intake manifold pressure of turbocharged engine to provide a close control of exhaust smoke. It limits the fuel pressure to the injectors when acceleration speeds are below normal operating speed range and manifold air pressure is not sufficient for complete combustion.

b. *Removal and Disassembly.*

(1) Remove elements (para 3-10).

(2) Remove and disassemble aneroid as illustrated in figure 4-28.

c. *Cleaning and Inspection.*

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks, wear and other damage. Replace defective parts as necessary.

d. *Reassembly and Installation.*

Reassemble and install aneroid as illustrated in figure 4-28.

(2) Install elements (para 3-10).

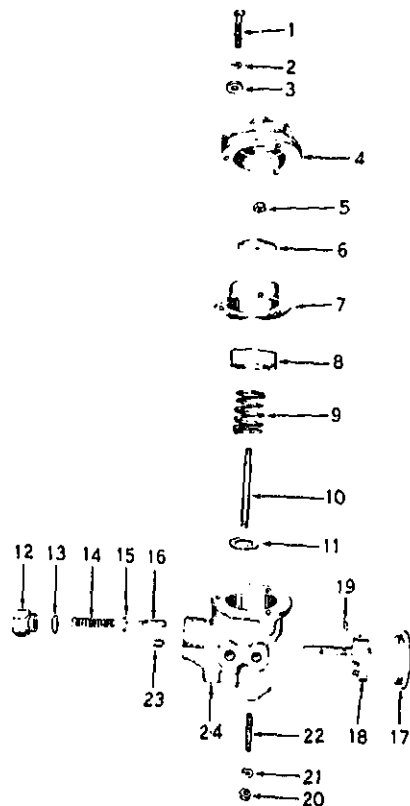
e. *Adjustment.*

(1) Fuel pump must be calibrated before adjusting aneroid; refer to DS Maintenance. Fill aneroid with lubricating oil.

(2) Check fuel manifold pressure as follows:

(a) Disconnect pressure line and drain line from aneroid to fuel pump. Disconnect air line from aneroid to air intake manifold. Plug lines and connections to keep air out of fuel system.

(b) Check fuel manifold pressure with pressure gage. Accelerate from idle to full throttle and check maximum pressure indicated on gage.



ME 2420-206-12/4-28 (2)

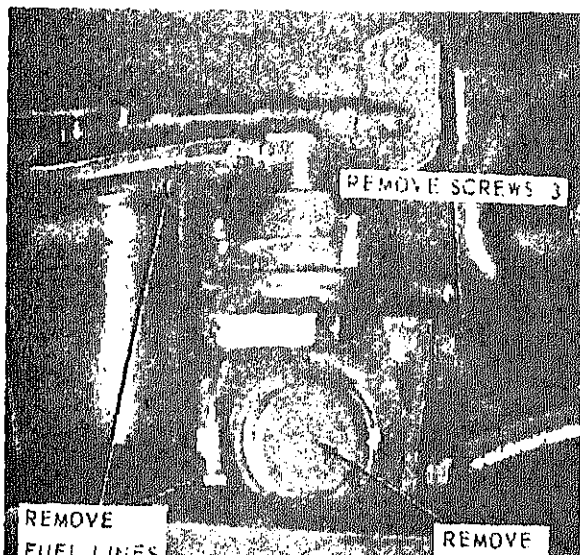
1 Screw	13 Packing
2 Washer	14 Spring
3 Washer	15 Washer
4 Cover	16 Plunger
5 Nut	17 Cover
6 Washer	18 Lever and valve assembly
7 Bellows	19 Packing
8 Piston	20 Nut
9 Spring	21 Seal
10 Shaft	22 Screw
11 Shim	23 Pin
12 Retainer	24 Housing

Figure 4-28. Aneroid, removal, disassembly, reassembly and installation (sheet 2 of 2).

Pressure must be 2000 psi at 2300 rpm. Refer error to DS Maintenance.

(3) Check air intake manifold pressure with mercury manometer. Pressure should be 34 to 36 psi. If pressure is low, check turbocharger for proper operation.

(4) Connect fuel lines from aneroid to fuel



(7) Make final adjustments as follows:

(a) Connect line from aneroid to air intake manifold.

(b) Start engine and check idle speed. In most cases, idle will be low and must be adjusted upward with fuel pump governor idle screw.

(c) Check engine operation. If smoke is not excessive during first 15 seconds of full throttle operation, but becomes excessive thereafter, check fuel system and turbocharger before readjusting aneroid.

(d) If hard starting is encountered, aneroid valve may be sticking in the open position. Replace if necessary.

4-36. Engine Speed Governor (Indicating)

a. Removal and Disassembly.

(1) Refer to paragraph 4-20 and figure

(2) Disassemble engine speed governor as illustrated in figure 4-29.

b. Cleaning and Inspection.

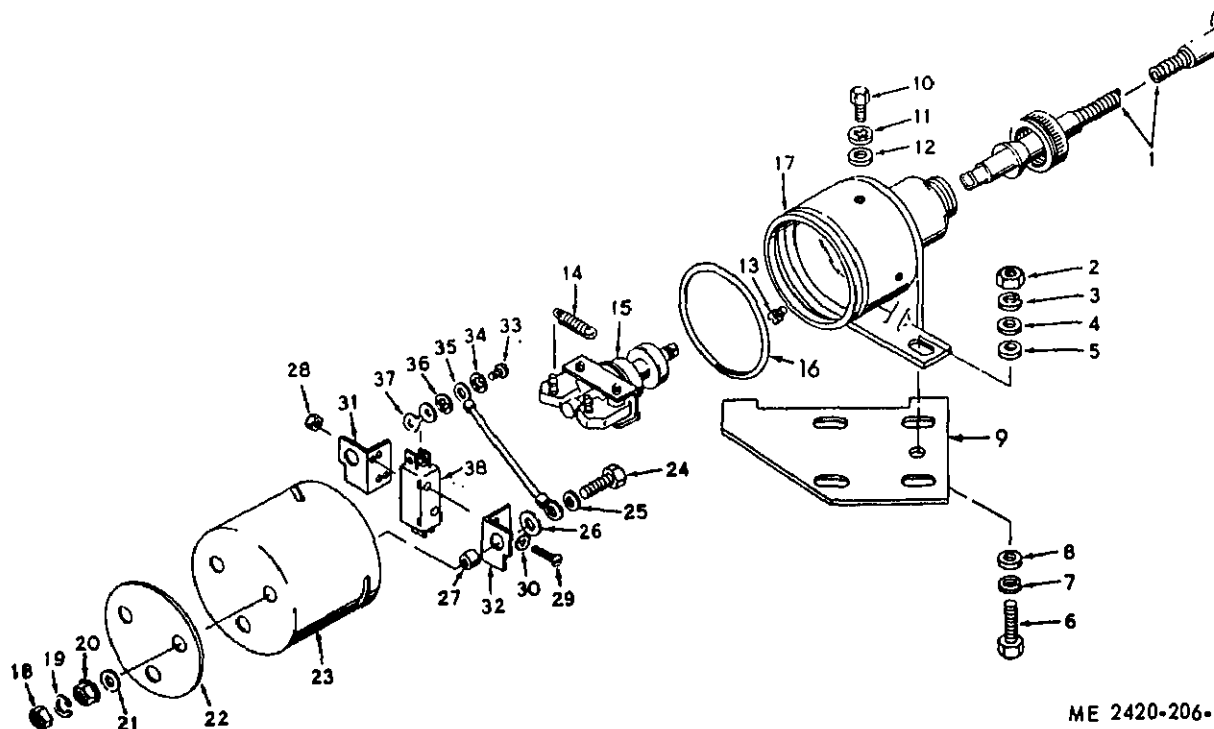
(1) Clean parts and dry thoroughly. Replace preformed packing.

(2) Inspect for cracks, breaks, wear and damage. Replace defective parts as necessary.

c. Reassembly and Installation.

(1) Reassemble and install engine speed governor as illustrated in figure 4-29.

(2) Refer to paragraph 4-20 and figure



ME 2420-206-

- 1 Drive shaft
- 2 Nut
- 3 Lockwasher
- 4 Flatwasher
- 5 Rubber washer
- 6 Capscrew
- 7 Lockwasher
- 8 Flatwasher
- 9 Overspeed top bracket

- 20 Nut
- 21 Flatwasher
- 22 Insulating washer
- 23 Cap
- 24 Capscrew
- 25 Flatwasher
- 26 Insulating washer
- 27 Insulating bushing
- 28 Nut
- 29 Screw
- 30 Lockwasher
- 31 Right switch mounting bracket
- 32 Left switch mounting bracket
- 33 Screw
- 34 Lockwasher

-13) and upper radiator hose.

b. Cleaning and Inspection.

(1) Clean metal parts and dry thoroughly. Clean belts with a cloth.

(2) Inspect all parts for cracks, breaks and other damage. Replace defective parts as necessary. Replace belts in matched sets. Replace fan spacer

d. Belt Adjustment. Loosen fan pulley bracket cap screws (4, fig 4-22), nut (5), and turn adjust screw (2), on fan bracket support, to correct belt tension. Adjust belt tension for a deflection of 1 inch when belt is depressed manually (finger) midway between pulleys. Tighten cap screws, and install generator drive belt (para 4-28e).

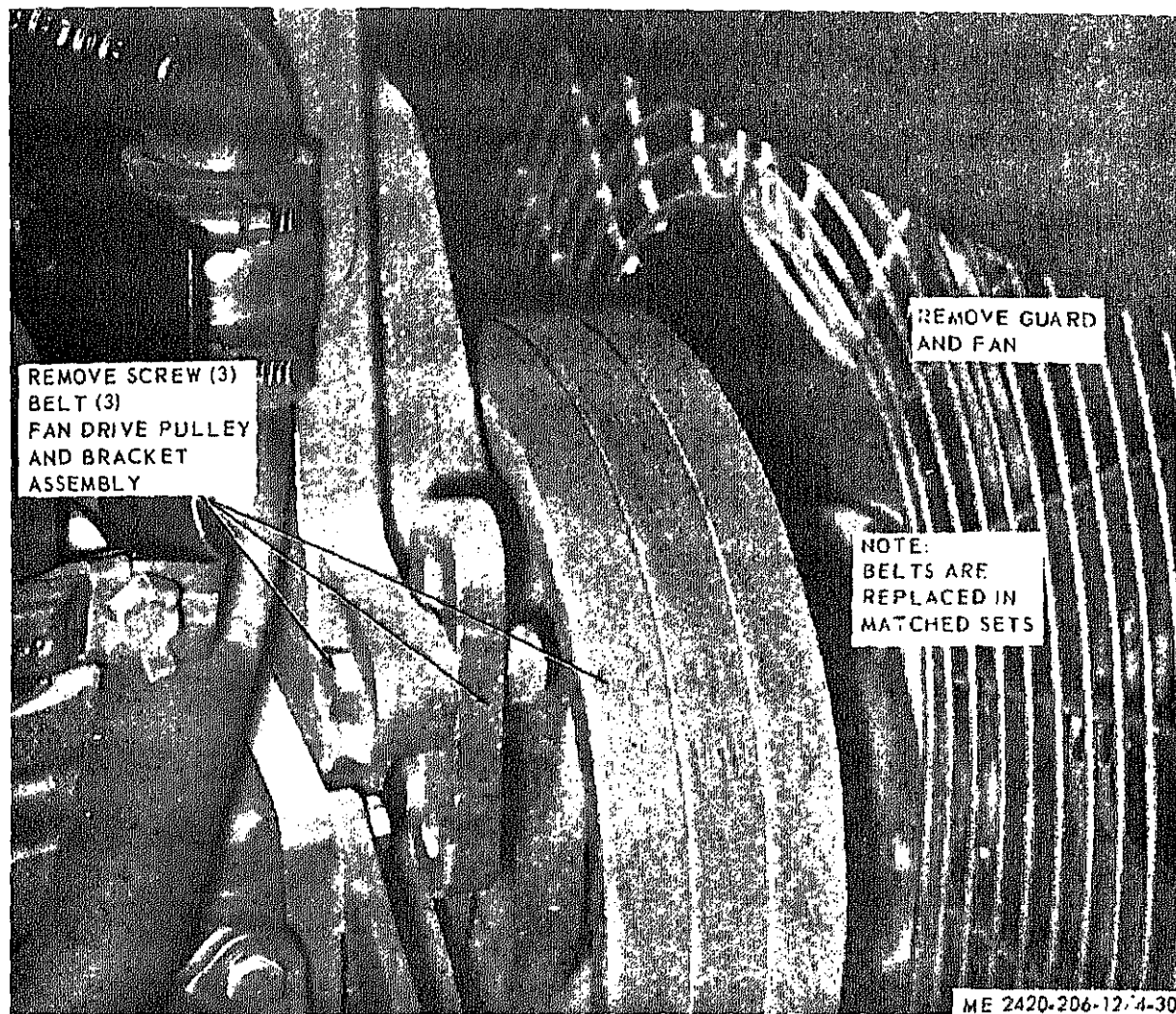


Figure 4-30. Fan drive pulley and belts, removal and installation.

38. Water Pump Belt

a. Removal and Installation.

(1) Remove generator belt (para 4-28).

(2) Water pump bracket screws must be loosened (do not permit coolant leaks). Turn water pump assembly and remove belt from pump pulley.

b. Belt adjustment.

(1) Turn water pump assembly to apply tension on belt, with screwdriver inserted in hole provided in water pump. Correct tension is 1 inch deflection when belt is depressed manually (finger) midway between pulleys.

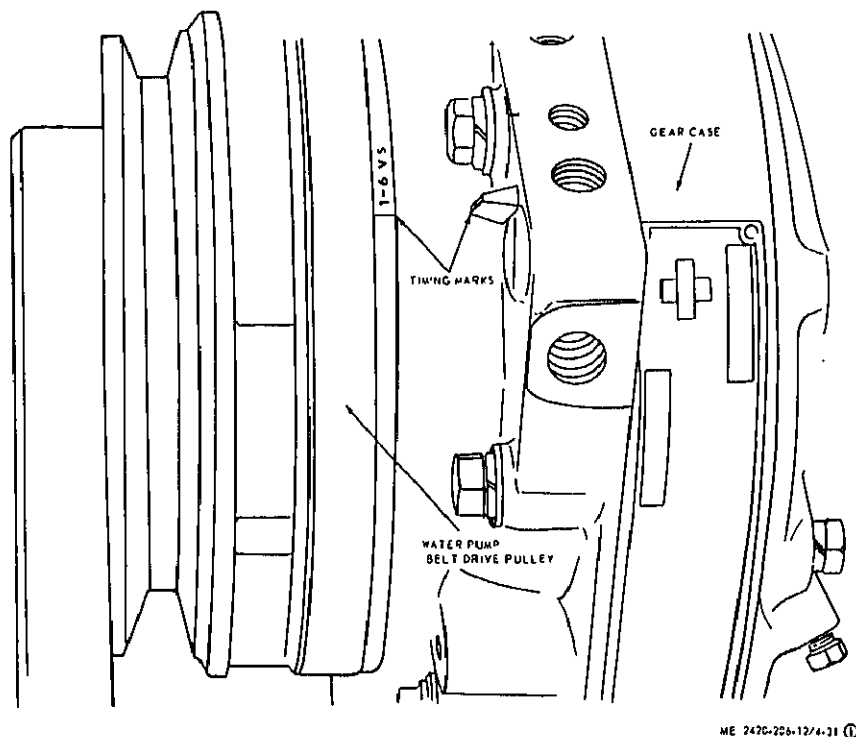
(2) Tighten water pump bracket screws.

4-39. General

Engine timing as contained herein, refers to adjustment of cylinder fuel injectors, crossheads and valves.

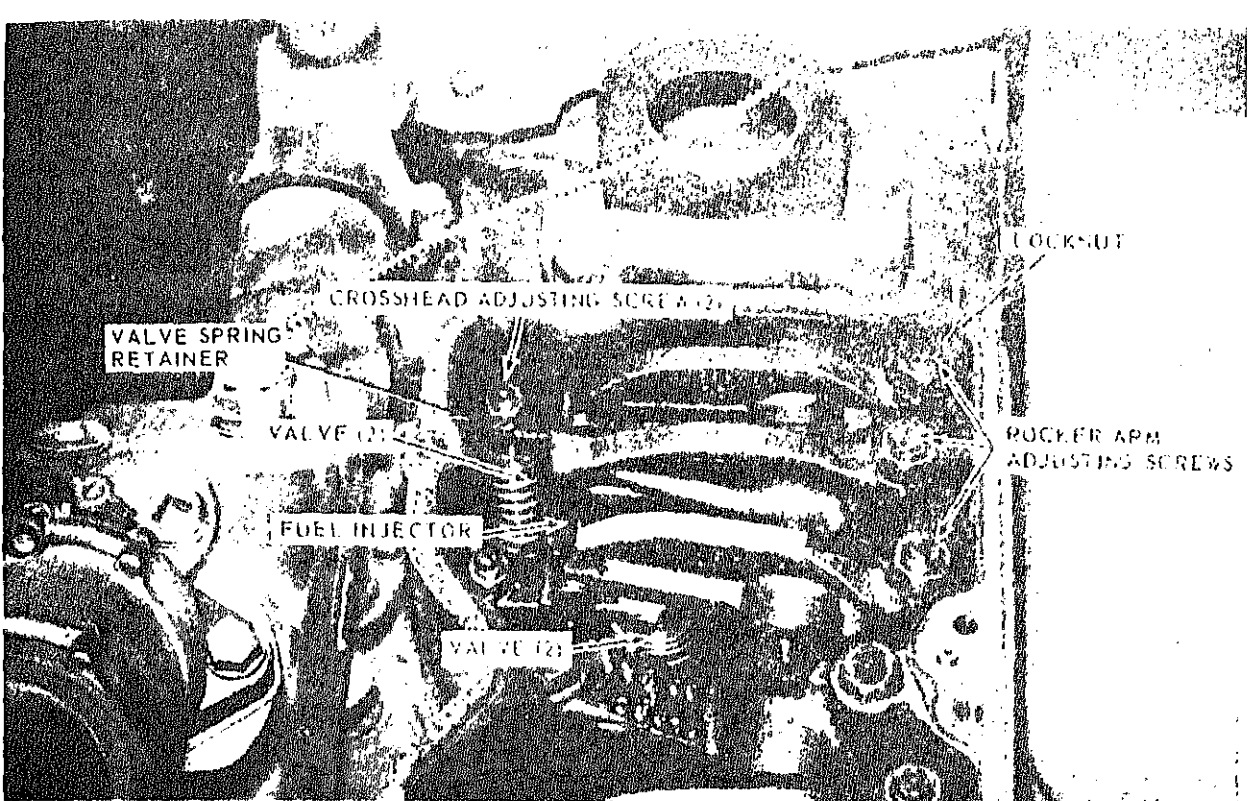
4-40. Timing Adjustments

a. Turn engine over manually to cylinder mark on pulley as illustrated in figure 4-31.



ME 2420-205-12/4-31 ①

*Figure 4-31. Cylinder timing mark and timing adjustments.
(Sheet 1 of 2).*



1. REMOVE HOOD.
2. REMOVE TURBOCHARGER.
3. REMOVE ROCKER ARM COVERS.
4. USE CYLINDER FIRING ORDER 1-5-3-6-2-4 AND TURN ENGINE OVER MANUALLY (BY DEPRESSING V-BELTS TO TIGHTEN) IN NORMAL DIRECTION (RIGHT-HAND ROTATION VIEWED FROM FAN END), TO TIME MARKS FOR NO. 1 CYLINDER.
5. ADJUST FUEL INJECTOR, CROSSHEAD AND VALVES AS FOLLOWS.
 - A. FUEL INJECTOR: MAKE SURE ROCKER ARM ADJUSTING SCREWS SEATED IN PUSHROD SOCKET, TORQUE ADJUSTING SCREW 45 INCH POUNDS (COLD), 60 INCH POUNDS (HOT). TORQUE LOCKNUT 79 TO 80 FOOT POUNDS.
 - B. CROSSHEAD: LOOSEN ADJUSTING SCREW LOCKNUT AND BACK OFF SCREW ONE TURN WITH A LIGHT FINGER PRESSURE APPLIED TO CROSSHEAD, HOLD IN CONTACT WITH VALVE STEM. USE ADJUSTING SCREW TO ALINE STEM TO ROPE AND EQUALIZE PRESSURE ON VALVE STEMS. TORQUE LOCKNUT 25 TO 30 FOOT POUNDS. CHECK CLEARANCE BETWEEN CROSSHEAD AND VALVE SPRING RETAINER WITH A WIRE GAGE. MINIMUM CLEARANCE MUST BE 0.020 TO 0.025 INCH.
 - C. VALVES: LOOSEN ROCKER ARM LOCKNUT AND BACK OFF ADJUSTING SCREW. INSERT FEELER GAGE BETWEEN ROCKER ARM AND CROSSHEAD. THE GAGE THICKNESS MUST BE AS FOLLOWS:
 - INTAKE VALVES (CROSSHEAD) (COLD) 0.016 INCH (HOT) 0.015 INCH.
 - EXHAUST VALVES (COLD) 0.029 INCH (HOT) 0.027 INCH.
 ADJUST SCREW UNTIL ROCKER ARM TOUCHES FEELER GAGE. TORQUE LOCKNUT 79 TO 80 FOOT POUNDS.
6. INSTALL ROCKER ARM COVERS, TURBOCHARGER AND HOOD.

ME 2420-206-12 4-31 (2)

*Figure 4-31. Cylinder timing mark and timing adjustments
(Sheet 2 of 2).*

b. Adjust injectors, crossheads, and valves in that order before cranking engine to cylinder time mark 5-6VS.

4-41. Fuel injectors.

tube and tip back injector lever until the injector can be removed.

(3) Remove two capscrews that secure the down plate of the injector to the cylinder head. Use one of the removed screws as a jacking screw to lift the injector tube and tip back the injector lever until the injector can be removed.

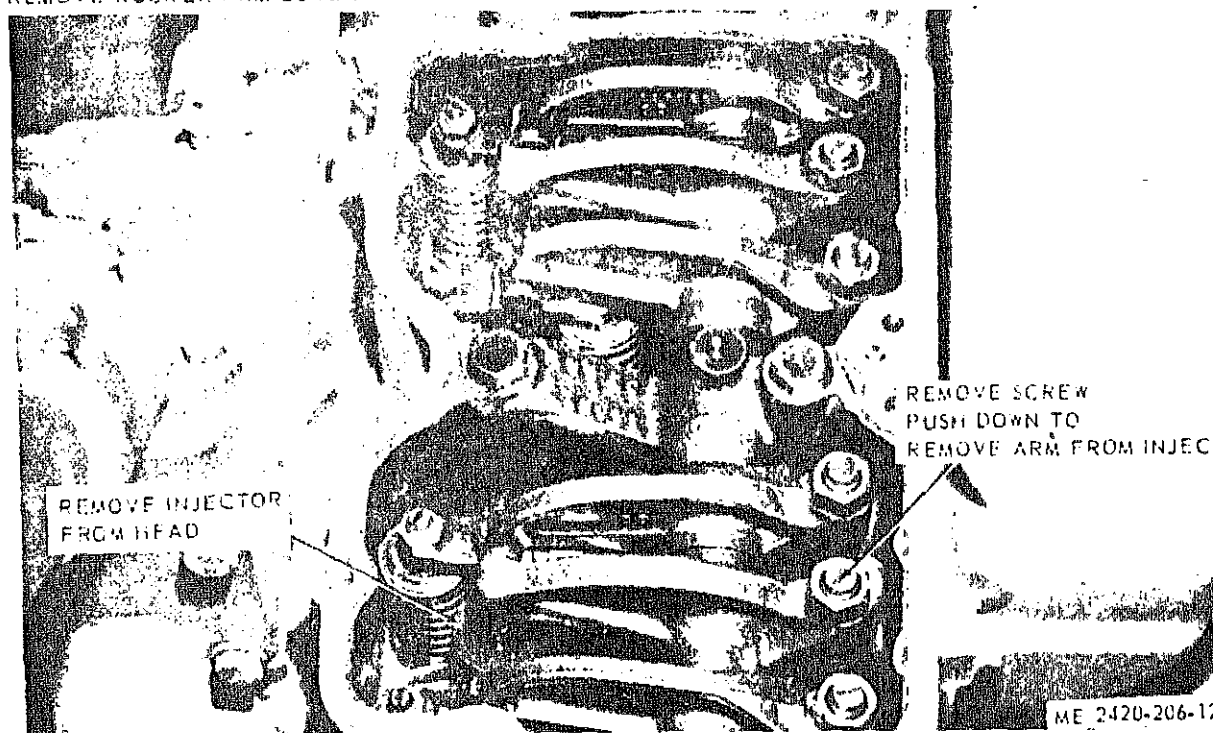


Figure 4-32. Fuel injector, removal and installation.

b. Installation and adjustment.

(1) Install fuel injector in reverse order of removal, fig. 4-32.

(2) Refer to paragraph 4-40 and adjust

(3) Install new rocker arm cover gasket

Section VII. STEERING AND SCRAPER HYDRAULIC SYSTEM

4-42. General

This section consists of steering and scraper hydraulic hose, lines, fittings, tank, filter, valves and cylinders.

4-43. Swivels and Hydraulic Lines

a. Description. The swivels provide 360° movement in one or more positions to prevent hydraulic lines connecting tractor and scraper from twisting or kinking.

b. Removal and Disassembly. Remove and disassemble hydraulic lines and swivels, and remove

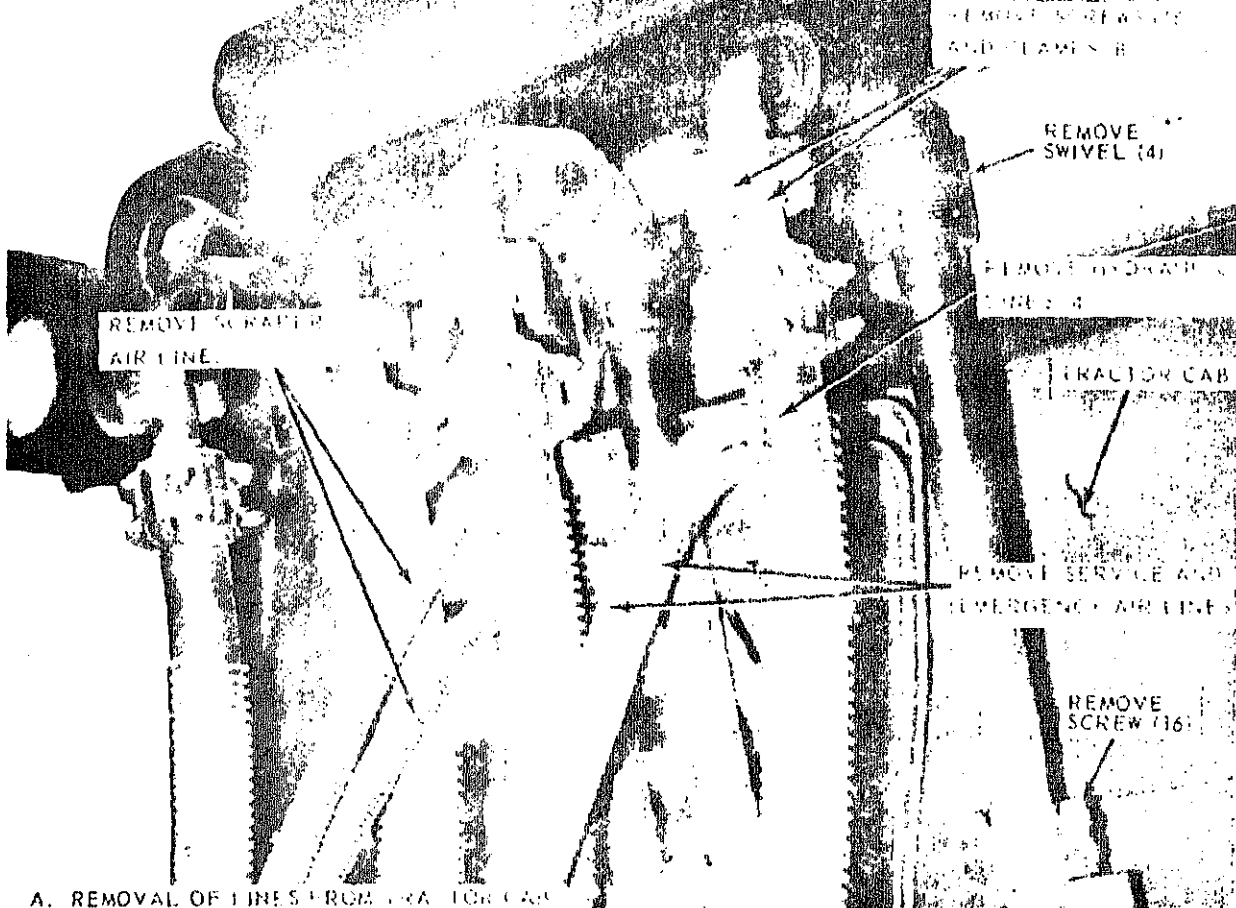
thoroughly.

(2) Inspect for wear, cracks, breaks, and damage. Replace defective parts as necessary.

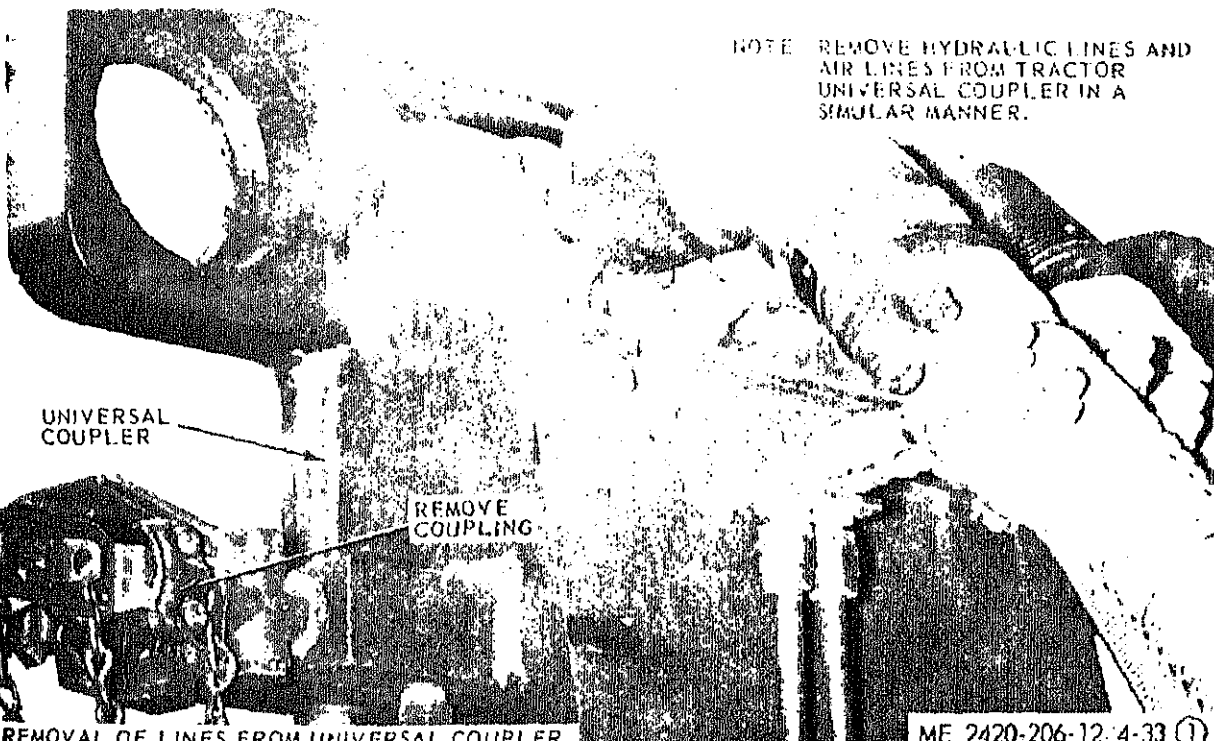
d. Reassembly and Installation.

(1) Reassemble and install hydraulic lines, swivels and install coupling as illustrated in assembled view of figure 4-33. Before installing pipe plug (14), install grease fitting and install with MIL-G-3278 until grease appears at fitting. Use caution that balls are not displaced by removal of grease fitting and install pipe plug.

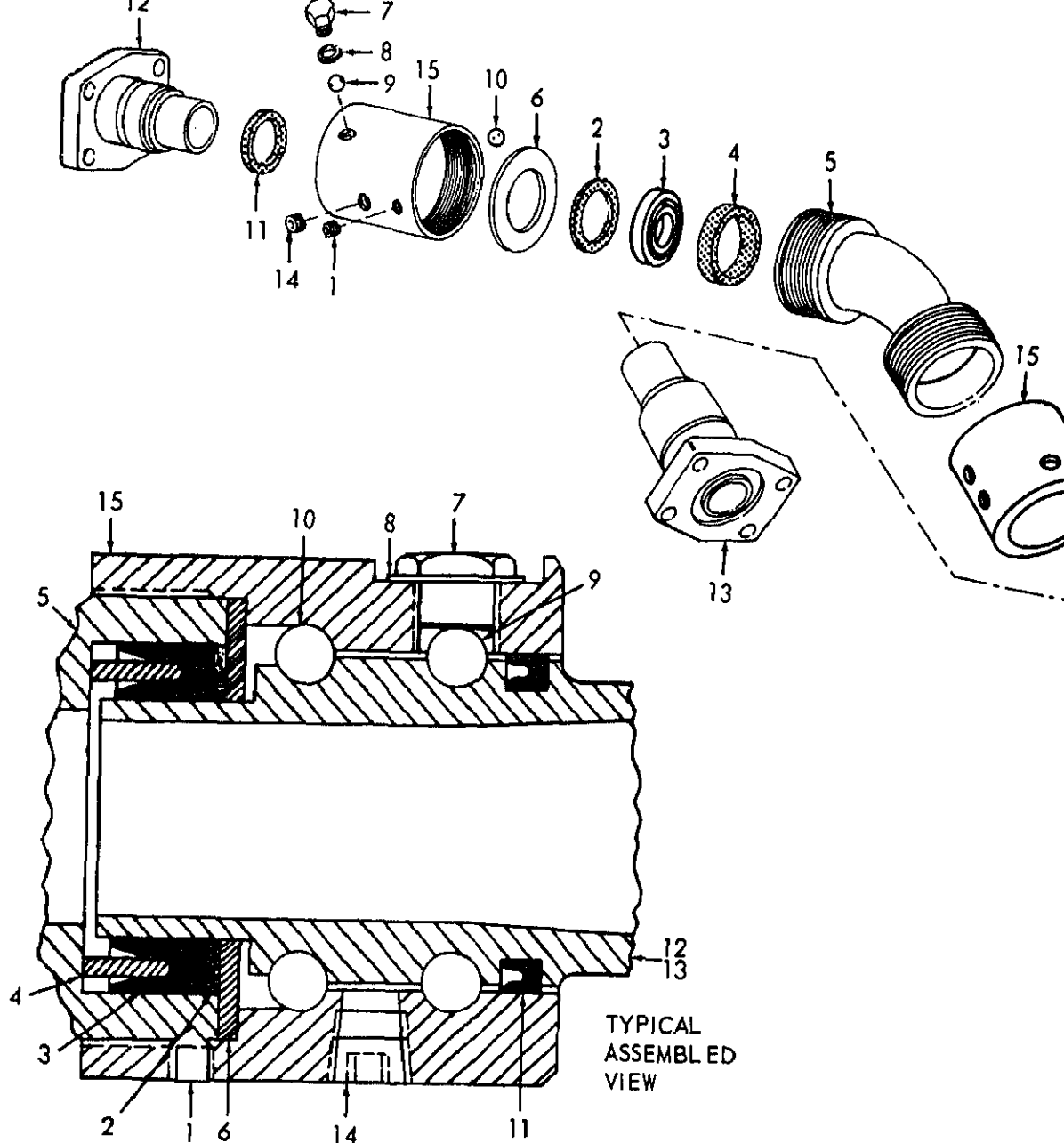
(2) Lips of dust seal (11) and U-cup



A. REMOVAL OF LINES FROM TRACTOR CAB



B. REMOVAL OF LINES FROM UNIVERSAL COUPLER

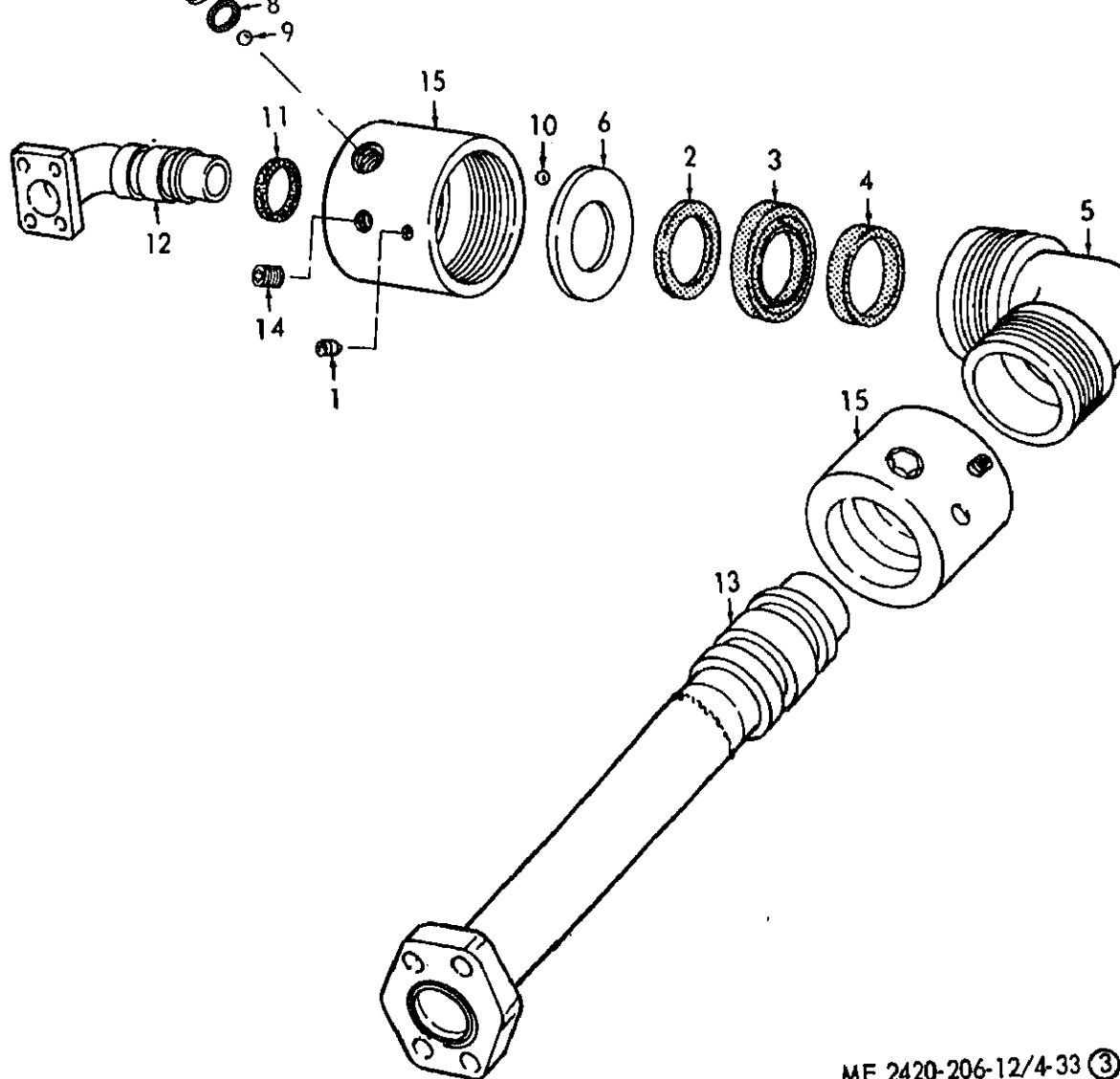


ME 2420-206-12/4-33 ②

1 Setscrew
2 Ring
3 Seal
4 Spacer
5 Retainer
6 Ring
7 Plug
8 Washer

9 Bearing
10 Bearing
11 Seal
12 Sleeve
13 Sleeve
14 Plug
15 Casing

Figure 4-33. Swivels and hydraulic lines, removal, disassembly, reassembly, and installation (sheet 2 of 3).



ME 2420-206-12/4-33 ③

1 Setscrew
2 Ring
3 Seal
4 Spacer
5 Retainer
6 Ring
7 Plug
8 Washer

9 Bearing
10 Bearing
11 Seal
12 Sleeve
13 Sleeve
14 Plug
15 Casing

Figure 4-33. Swivels and hydraulic lines, removal, disassembly, reassembly, and installation (sheet 3 of 3).

4-4. Hydraulic Filter Base

a. Removal.

- (1) Remove element (para 3-7).
- (2) Remove hydraulic filter base, figure 4-34.

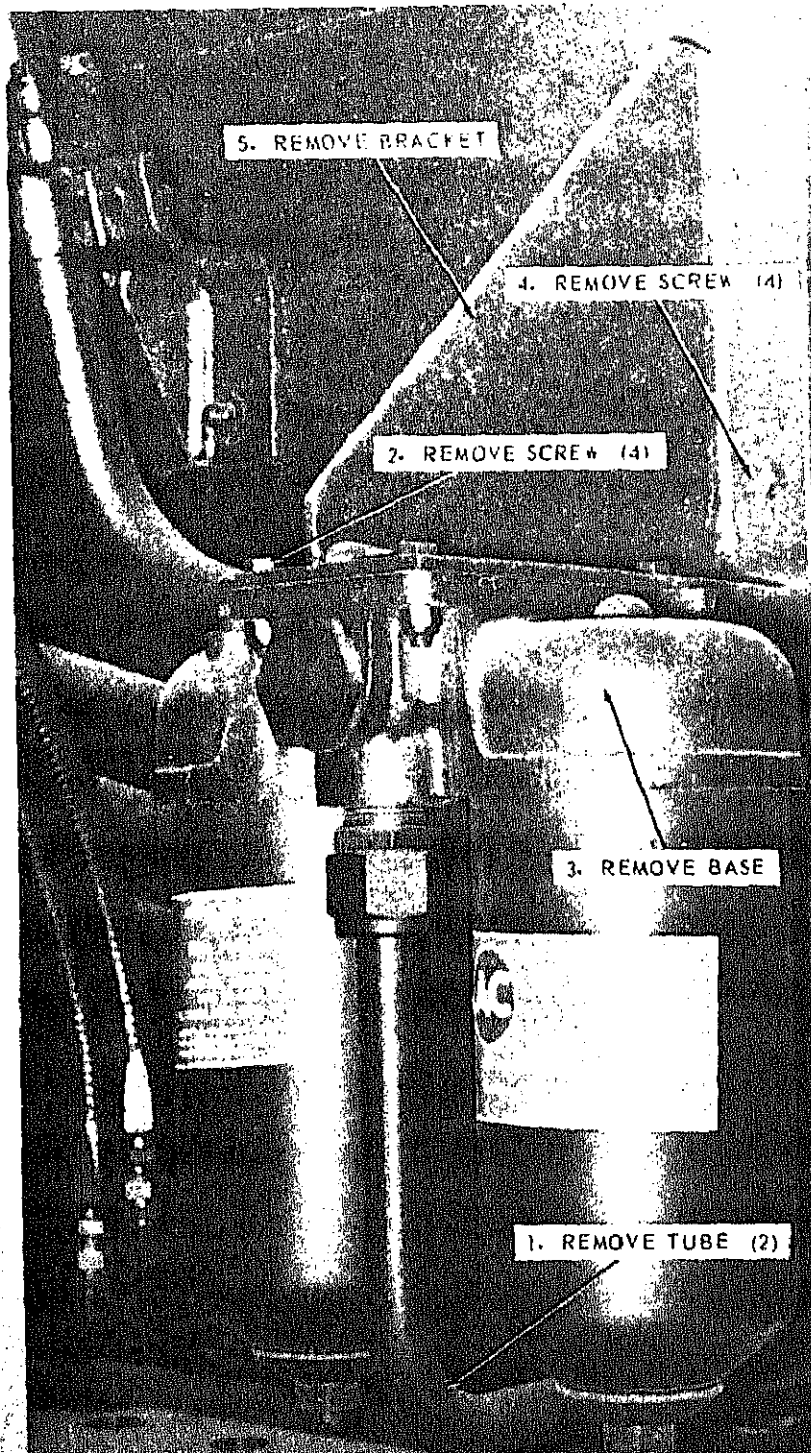
b. Cleaning and Inspection.

- (1) Clean parts and dry thoroughly.

damage. Replace defective parts as needed.

c. Installation.

- (1) Install hydraulic filter base in position of removal, *a* above.
- (2) Install elements (para 3-7).



5. Push Start Pump and Valve

a. *Removal.* Remove pump and valve as illustrated in figure 4-35.

b. *Cleaning and Inspection.*

- (1) Clean exterior and dry thoroughly.
- (2) Inspect for cracks, breaks, and other dam-

age. Rotate pump input shaft and check for rough catching, or noisy operation. Replace defective parts as necessary.

c. *Installation.* Install valve and pump as illustrated in figure 4-35. Replace push start pump gasket.

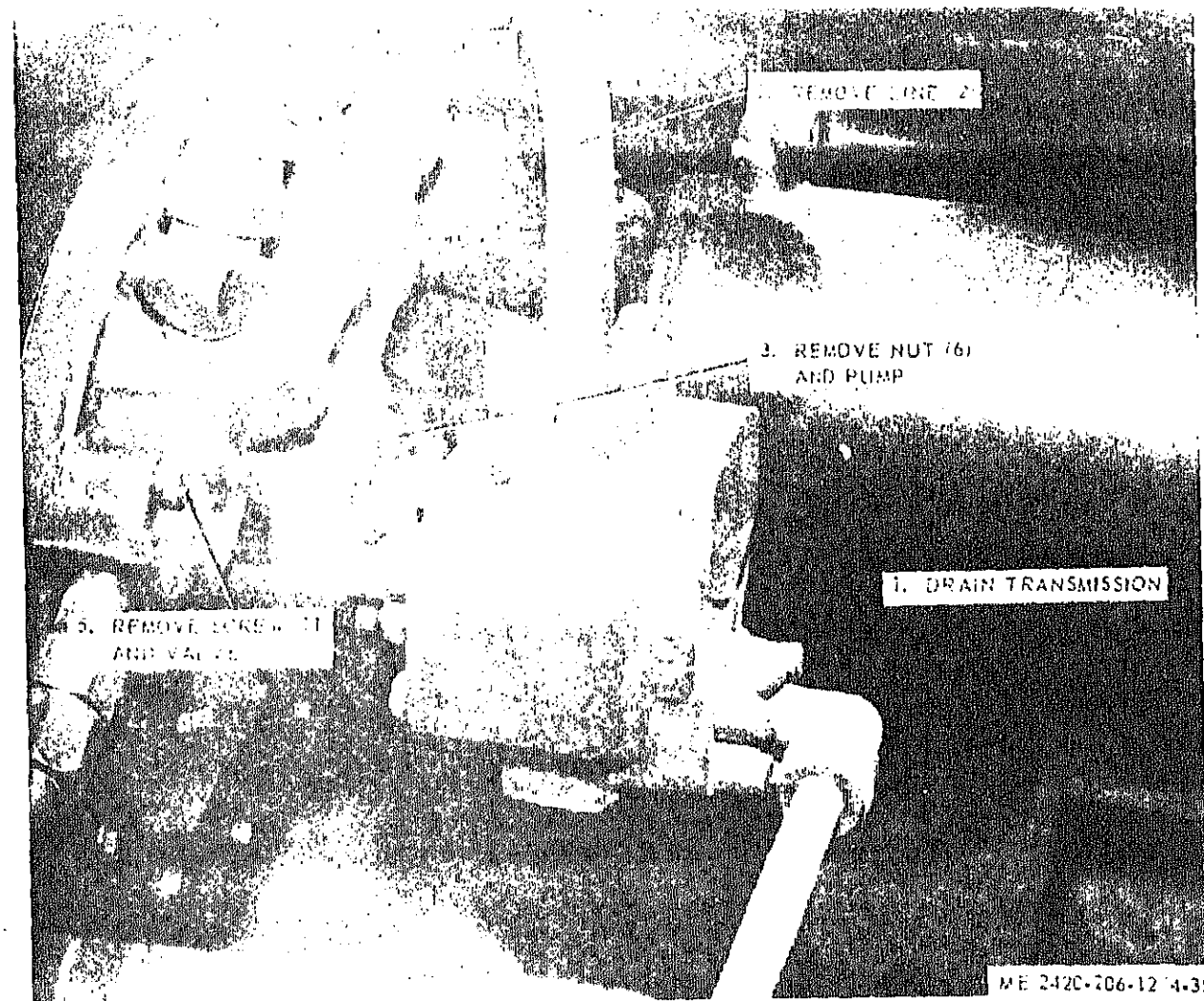


Figure 4-35. Push start pump and valve, removal and installation.

a. **Removal and Disassembly.** Remove and disassemble steering hydraulic cylinder as illustrated figure 4-36. Drain lines into a container. Lift and secure cylinder; do not damage piping. Remove nuts and anchor pins securing cylinder to tractor frame.

b. **Cleaning and Inspection.**

- (1) Clean parts and dry thoroughly.
- (2) Inspect for cracks, breaks and other damage.

c. **Reassembly and Installation.** Reassemble and install steering hydraulic cylinder as illustrated figure 4-36. Lubricate inside of cylinder bore and all packing with MIL-L-2104A oil. Torque nut (1) to 1,000 foot-pounds and capscrew (2) to 185 foot-pounds. Tighten capscrews (12) finger tight and install lockwire (11). Correct fluid level in hydraulic tank as necessary.

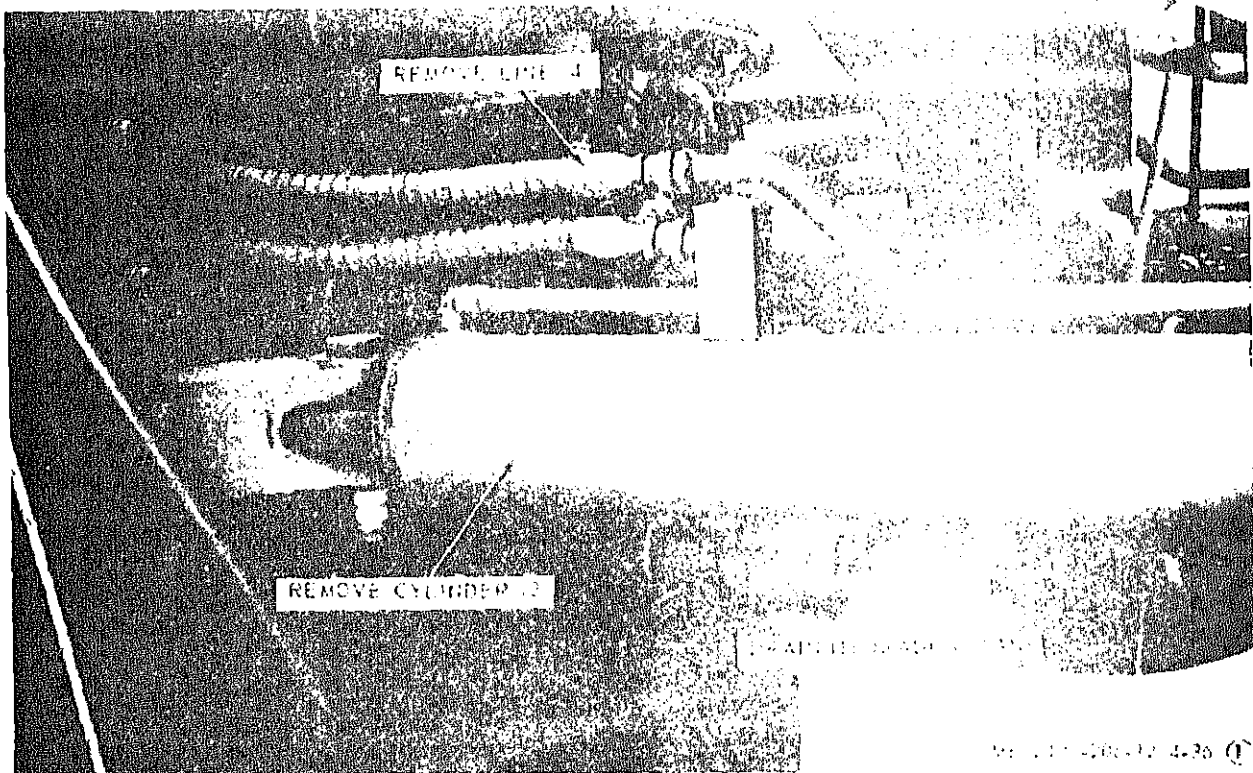
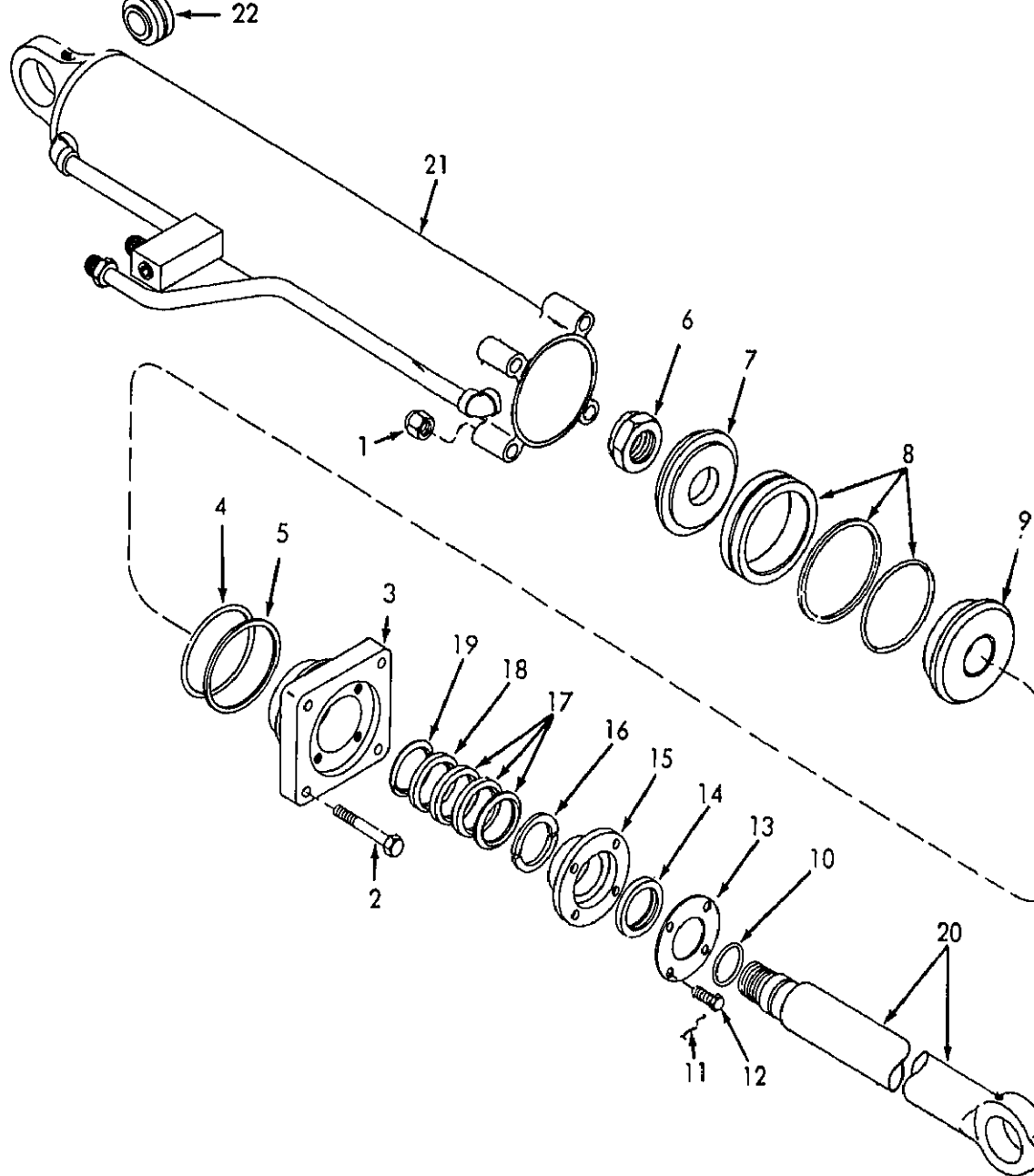


Figure 4-36. Steering hydraulic cylinder, removal, disassembly, reassembly and installation (sheet 1 of 2).



ME 2420-206-12

- 1 Nut
- 2 Screw
- 3 Cap
- 4 Packing
- 5 Ring
- 6 Nut
- 7 Piston
- 8 Wear ring assembly
- 9 Piston
- 10 Packing
- 11 Wire

- 12 Screw
- 13 Retainer
- 14 Seal
- 15 Gland
- 16 Adapter
- 17 Packing
- 18 Packing
- 19 Adapter
- 20 Rod
- 21 Tube assembly
- 22 Bearing (do not remove unless damaged)

a. Removal.

(1) Remove screws that secure floorplates, remove floorplates.

(2) Remove bulldozer hydraulic valve as illustrated in figure 4-37.

b. Cleaning and Inspection.

(1) Wipe valve with a cloth and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective valve and floorplates as necessary.

c. Installation.

(1) Install bulldozer hydraulic valve as illustrated in figure 4-37.

(2) Install floorplates.

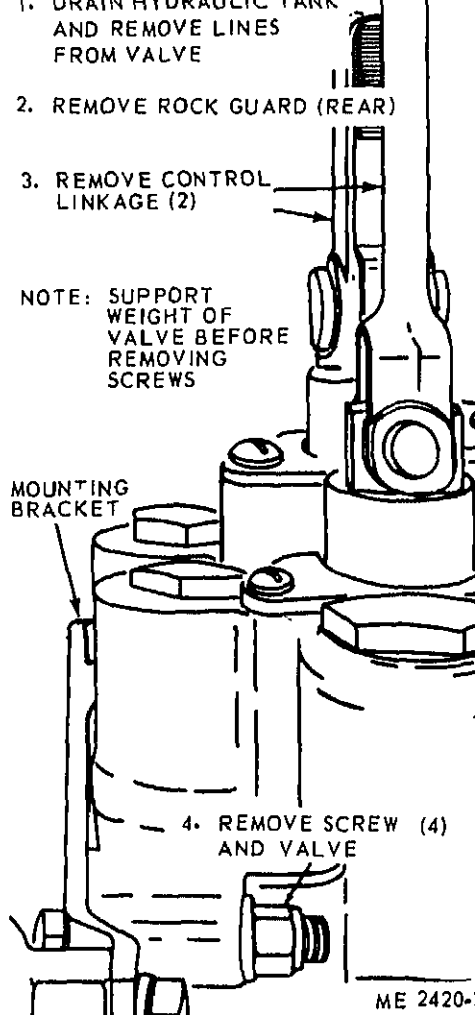


Figure 4-37. Bulldozer hydraulic valve, removal and installation.

4-48. Scraper Hydraulic Valve

a. *Removal.* Remove scraper hydraulic valve as illustrated in figure 4-38.

b. *Cleaning and Inspection.*

(1) Wipe parts and dry thoroughly.

(2) Inspect for cracks, breaks and other age. Replace defective valve.

c. *Installation.* Install scraper hydraulic valve as illustrated in figure 4-38.

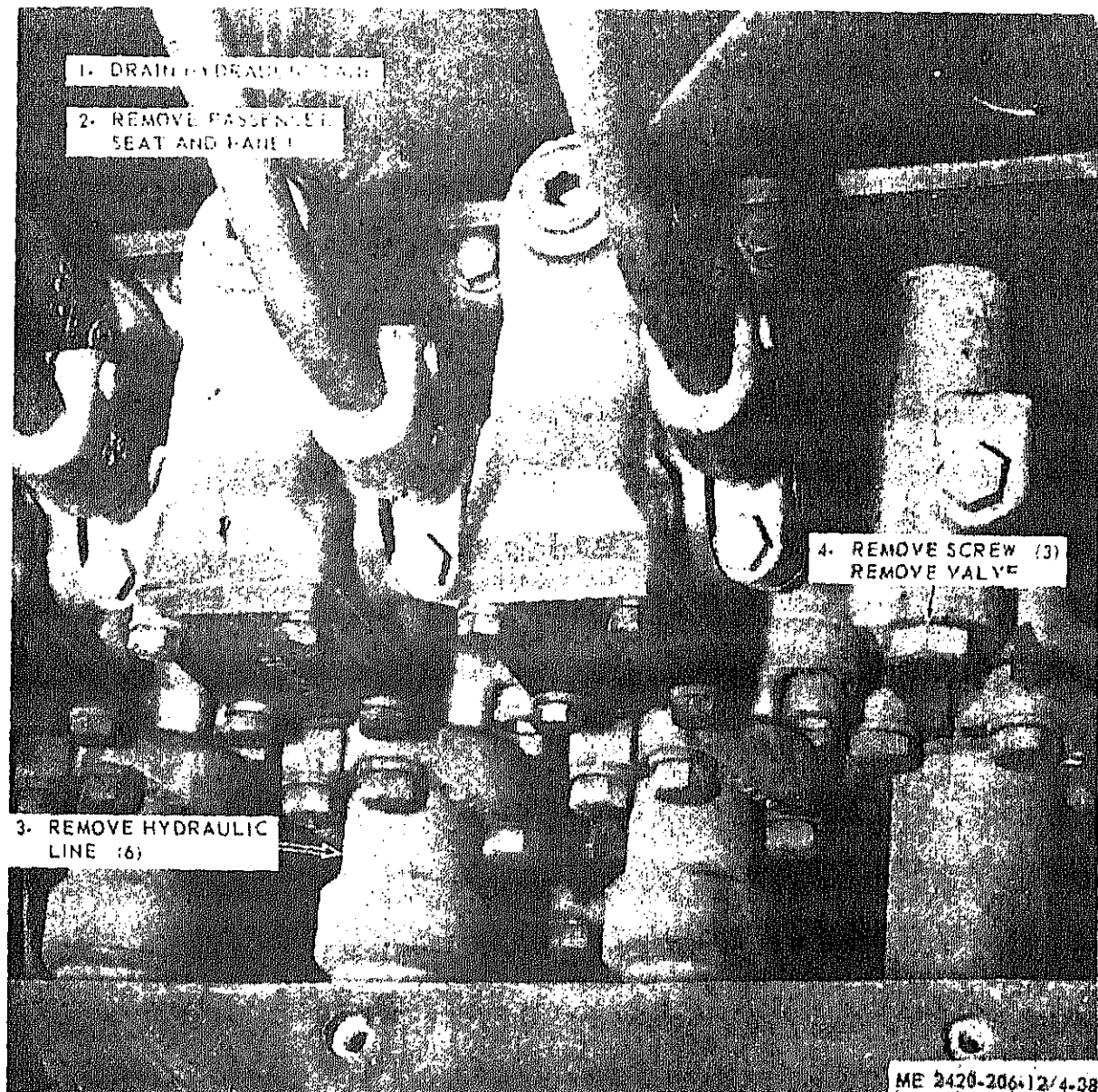


Figure 4-38. Scraper hydraulic valve, removal and installation.

tractor and scraper wheel brakes. The hydraulic system consists of tanks, valves, controls and accumulator, lines and fittings for application of controlled pressures to tractor and scraper wheel brakes.

4-50. Brake Actuator and Hydraulic Tank

a. Description. The brake system is an air-over-hydraulic type, in which air is used to actuate the hydraulic brake cylinder to apply brakes. The brake actuator is an integrated unit which contains both air cylinder and hydraulic brake cylinder. As air from air brake system is ported to brake actuator, the push rod in air cylinder in the brake actuator extends and applies force to a hydraulic piston at end of push rod. This forces hydraulic fluid into brake expander tube in the wheel brake.

b. Removal and Disassembly. Remove and disassemble brake actuator and hydraulic tank as illustrated in figure 4-39.

(1) Brake actuator.

(a) Remove capscrews (1, Fig 4-39 (sheet 2 of 3)) and lockwashers (2) that secure cylinder (18) to mounting bracket (21). Apply air pressure to air brake chamber to actuate brake. While cylinder is extended away from mounting bracket (21), remove retaining ring (3) that secures push rod (19, Fig 4-39 (sheet 3 of 3)) to the piston (5, Fig 4-39 (sheet 2 of 3)); remove piston and associated parts from the push rod. Slowly release air pressure from chamber.

(b) Remove retaining ring (4) that secures piston (5) to cylinder (18). Slide piston out of cylinder and remove washer (6), retaining ring (7), flat washer (8), spring (9), and ball (10). Remove preformed packings (11 and 12) from piston.

(c) Install cylinder in a soft-jawed vise and remove cap (13) from cylinder (18); remove preformed packing (14) from cap. Remove piston assembly (15) and spring (16) from cylinder; remove preformed packing (17) from piston.

(d) Remove two nuts (19) and flat washers (20) from push rod (19, Fig 4-39 (sheet 3 of 3)). Remove nuts (1) and lockwashers (2) that secure mounting bracket (21, Fig 4-39 (sheet 2 of 3)) to brake chamber. Remove capscrews (4), lockwashers cover (7, Fig 4-39 (sheet 3 of 3)).

(e) Remove boot (3) from push rod (19). Use C-clamps to clamp cover (7) to body (20) of brake chamber. Remove capscrews (4), lockwashers (5), and flat washers (6) that secure cover to body. Carefully loosen C-clamps and remove cover from

clamps to brake chamber before removing cover. Cover may cause cover to be ejected with enough force to cause bodily injury.

(f) Remove two springs (8 and 9) and spring guide (10) from brake chamber.

(g) Remove nuts (11) and lockwashers (12) that secure outer clamp (13) to body (20). Remove push rod (19), diaphragm (17), and associated parts from body by pulling out the push rod.

(h) Straighten the rolled diaphragm and remove outer clamp (13). Remove nuts (14) and lockwashers (15) that secure inner clamp (16) to diaphragm guide (18) to push rod (19). Remove inner clamp and diaphragm guide. Remove diaphragm (17) from diaphragm guide.

(2) Hydraulic tank.

(a) Position a container under hydraulic tank. Disconnect tank-to-brake cylinder line from fittings on tank. Allow lines and tank to drain.

(b) Remove four capscrews, washers, and nuts that secure tank to tractor frame; remove tank.

(c) Remove filler cap and breather from tank.

c. Cleaning and Inspection.

(1) Clean actuator and dry thoroughly.

Caution: Do not immerse piston assembly (15, fig. 4-39 (sheet 2 of 3)) in cleaning solution. It will destroy the internal coated parts of piston.

Note. Discard all preformed packings.

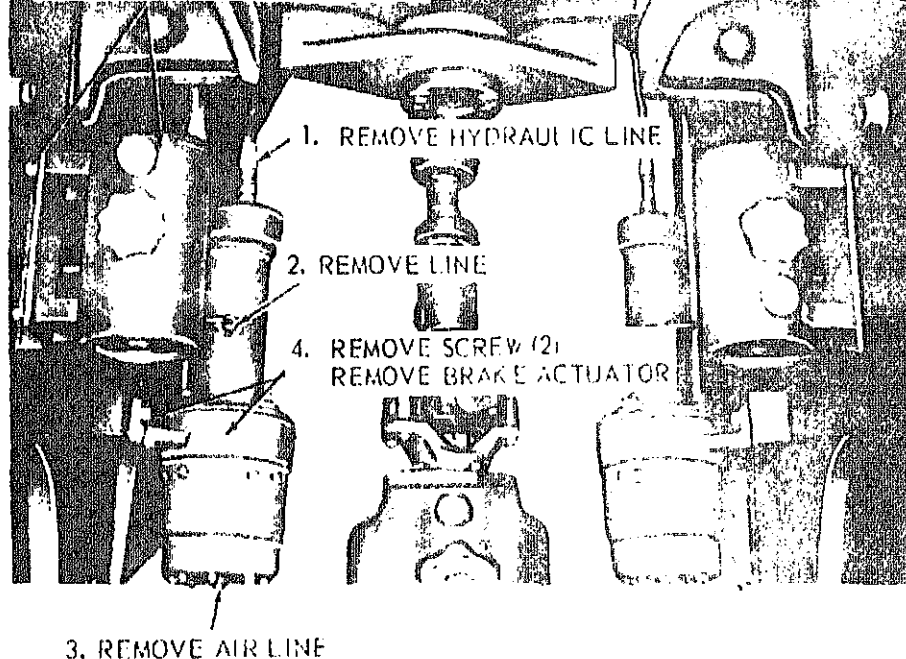
(2) Clean tank and dry thoroughly. Pour solvent into tank and agitate to remove sludge from interior. Immerse breather in solvent and agitate to remove dust and dirt. Shake out excess solvent.

(3) Inspect actuator and tank for cracks, breaks, and other damage. Check operation of actuator's piston assembly (15) by inserting smooth, blunt tool into the small opening in the face of piston assembly and pushing forward. If definite movement cannot be easily obtained, replace piston assembly. If there is movement, apply low pressure compressed air at opening to produce a pressure inside piston assembly. If air passes through, replace piston assembly. Replace defective parts as necessary.

d. Reassembly and Installation. Install tank and actuator as illustrated in figure 4-39.

(1) Brake actuator.

(a) Lubricate inside of brake chamber body (20, Fig 4-39 (sheet 3 of 3)) and both sides



3. REMOVE AIR LINE

NOTE: REMOVE OTHER BRAKE ACTUATORS AND TANKS IN A SIMILAR MANNER.

40. 200. 20. 12. 4. 7. (1)

Figure 4-39. Brake actuator and hydraulic tank, removal, disassembly, reassembly and installation (sheet 1 of 3).

(b) Lay inner clamp (16) on a bench and position the small end of diaphragm (17) inside flange. Slide diaphragm guide (18) and push rod (19) down into the diaphragm, position them on bolts of the inner clamp, and secure with nuts (14) and lockwashers (15).

(c) Slide diaphragm assembly down into the outer clamp (13) and roll diaphragm back over fluted edge of outer clamp.

(d) Slide assembled push rod and diaphragm into body (20) and position it so bolts of the outer clamp pass through holes provided; secure assembled push rod and diaphragm with nuts (11) and lockwashers (12).

(e) Position spring guide (10) and springs (9 and 8) on push rod; position cover (7) over push rod and, using C-clamps, align cover so it can be secured with capscrews (4), lockwashers (5), and flat washers (6); secure cover. Position boot (3) on cover and push rod.

(f) Connect brake chamber to a 100 psi compressed air line; apply pressure. The push rod must move out quickly without binding. Release the

(g) Cover boot (3) and cover (7) with suds and apply air pressure to brake chamber to check for leakage. If leakage is observed or operation of brake chamber is not quick and smooth, dismantle brake chamber and check for cause of faulty operation.

(h) Lubricate bore of cylinder (18, Fig. 4-39 (sheet 2 of 3)) with MIL-L-2104A, Amendment Grade 10. Insert spring (16) into bore of cylinder.

Caution: Do not use automotive brake fluid in this brake system. Automotive brake fluid will cause deterioration of rubber parts and greatly shorten the effective life of unit.

(i) Lubricate and place preformed packing (17) on piston assembly (15); insert piston assembly into cylinder (18). Position preformed packing in cap (13), turn cap onto the cylinder, and torque to 50 foot-pounds minimum.

(j) Position ball (10), spring (9), and washer (8) in the piston (5) and secure with retaining ring (7). Lubricate preformed packings (11)

into cylinder slot provided.

Note. The preformed packing (11) is identified by a white paint slash on its outside diameter. This preformed packing must be positioned in the correct groove for proper operation of the hydraulic brake cylinder.

(k) Position mounting bracket (21) on brake chamber cover (7, Fig 4-39 (sheet 3 of 3)); secure with lockwashers (2) and nuts (1). Place flat washer (20, Fig 4-39 (sheet 2 of 3)) and nuts (19) on push rod (19, Fig 4-39 (sheet 3 of 3)) so there is a distance of 9/16 inch between the face of washer and mounting bracket. When this distance has been attained, tighten the two nuts together to lock them in place.

(l) Position washer (6, fig 4-39 (sheet 2 of 3)) in the piston (5). Apply 100 psi air pressure to actuate brake chamber. While push rod (19, fig 4-39 (sheet 3 of 3)) is extended, slide assembled hydraulic brake cylinder on push rod so the nuts (19, fig 4-39 (sheet 2 of 3)) are up tight against flat washer (20); secure piston to the push rod by installing retaining ring (3) in the piston.

(m) Release air pressure from brake chamber and secure cylinder (18) to mounting bracket (21) with four capscrews (1) and lockwashers (2).

(2) Hydraulic tank.

(a) Fill hydraulic tank, LO 5-2420-206-12 and bleed brake system as follows:

Caution: Do not fill brake system with automotive brake fluid. This type of fluid is destructive to brake assemblies and hydraulic brake cylinders.

(b) Depress and hold brake treadle valve. Open bleeder valve to vent air from hydraulic brake cylinder. When no more fluid flows from bleeder, close and release brake treadle valve.

(c) Wait 2 minutes to permit hydraulic brake cylinder to fill; then check and refill the

(d) Repeat (b) and (c) above.

(e) Actuate and hold brake treadle for 10 seconds with bleeder closed; Wait 2 minutes, refill the brake reservoir and repeat this step.

(f) Repeat (b) and (c) above to bleed the brake side of automatic adjuster in the master cylinder and from expander tube. Repeat until no air can be detected escaping from bleeder.

Note. Wait 2 minutes after each brake bleed making the next application.

(g) Repeat (e) above enough times to insure that brake shoes are contracting the springs. Test by holding against engine power.

(h) Move to the bleeder for the other brake assemblies and repeat above procedure.

(i) After operating tractor for at least 1 hour, open bleeders, with brakes released, to release any remaining air which may have accumulated in top of system during use.

(j) Operational Inspection.

1. Inspect daily to insure that brake assembly mounting nuts have not loosened. Tighten to 270 foot-pounds if loose. Check for broken or sagging springs.

2. Inspect weekly for lining wear. Inspect for wear, apply brakes and visually inspect retracting spring on inside of brake shoes. If brake shoes tend to shear the retracting spring at a point between frame and shoes, the spring is maximum and brake blocks should be replaced.

Caution: Continued operation of tractor in this condition will result in damage to brake structure.

3. Inspect weekly for dirt accumulation between expander tube and brake assembly. If excess dirt is found that would impair operation of brakes, refer to direct support maintenance manual.

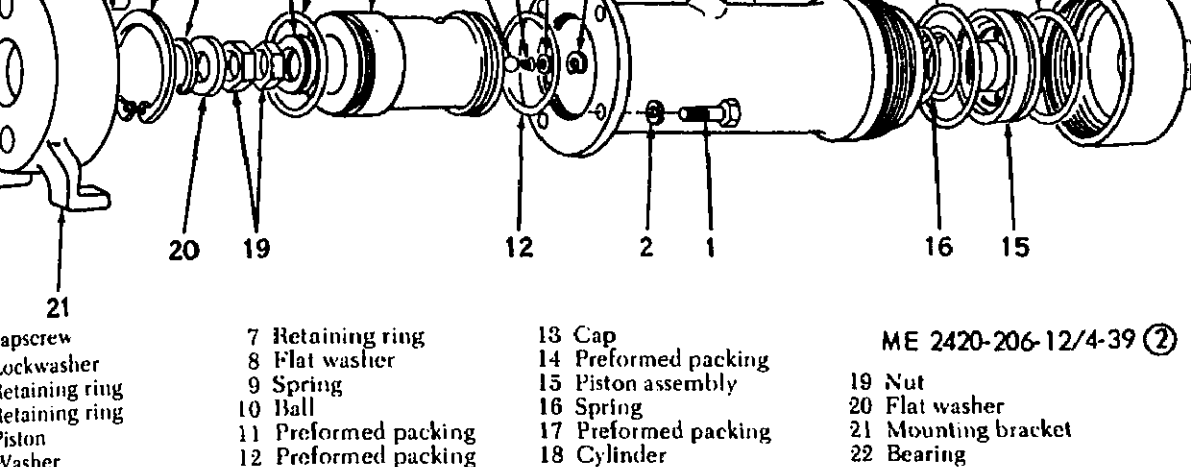
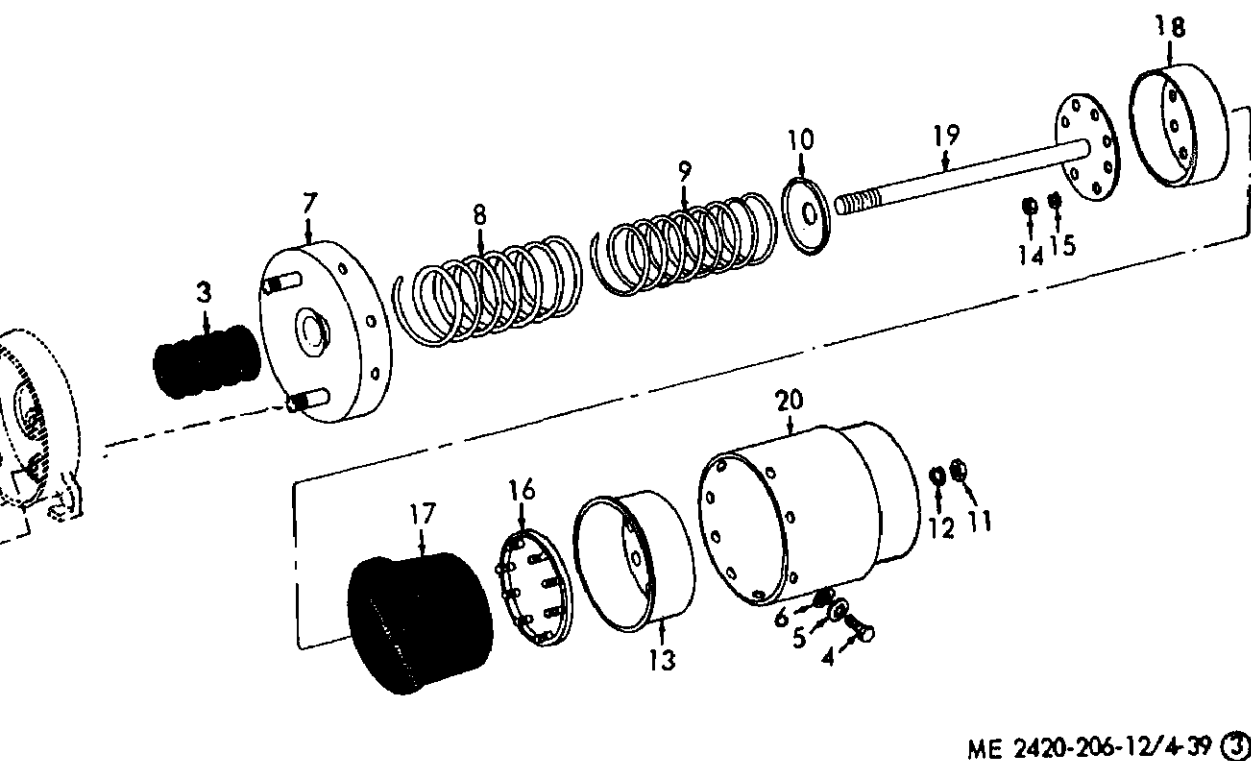


Figure 4-39. Brake actuator and hydraulic tank, removal, disassembly, reassembly and installation (sheet 2 of 3).



ME 2420-206-12/4-39 ③

Figure 4-39. Brake actuator and hydraulic tank, removal, disassembly, reassembly and installation (sheet 3 of 3).

a. *Removal.* Remove brake relay air valve as illustrated in figure 4-40.

b. *Cleaning and Inspection.*

(1) Clean with a cloth and dry thoroughly.

(2) Inspect parts for cracks, breaks or

damage. Replace defective parts as necessary.

c. *Installation.* Install brake relay air valve as illustrated in figure 4-40.

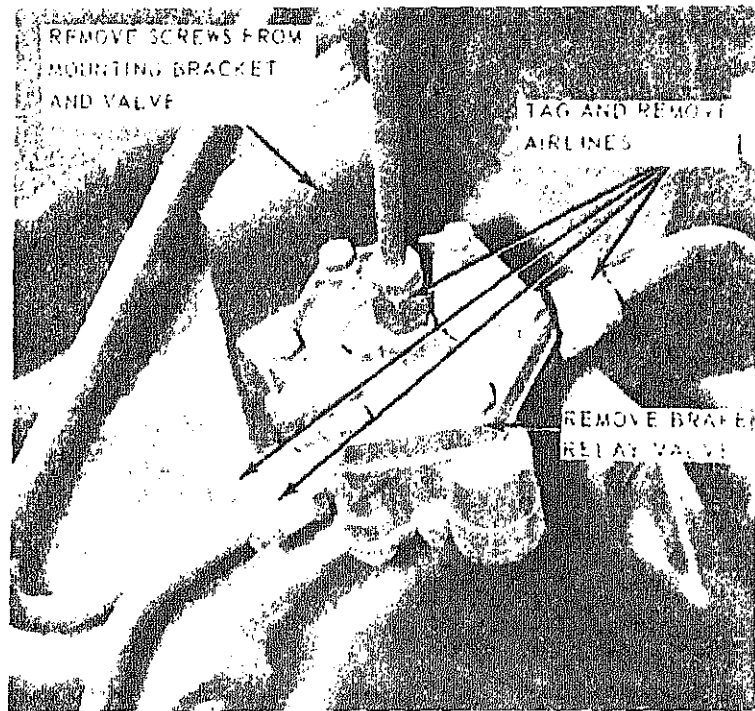


Figure 4-40. Brake relay air valve, removal and installation.

4-52. Check and Protection Valves and

Stoplight Switch

a. *Removal.* Remove check and protection valves and stoplight switch as illustrated in figure 4-41.

b. *Cleaning and Inspection.*

(1) Clean all parts and dry thoroughly.

(2) Inspect parts for cracks, breaks and other damage. Replace defective parts as necessary.

c. *Installation.* Install parts as illustrated figure 4-41.

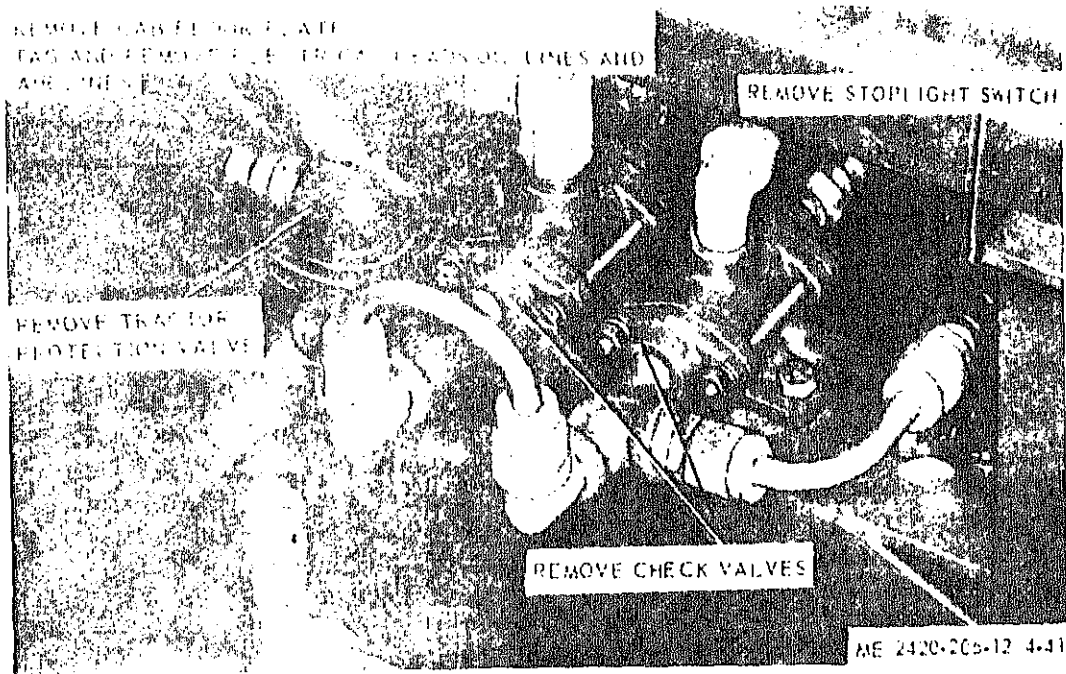


Figure 4-41. Check and protection valves and stoplight switch, removal and installation.

b. Cleaning and Inspection.

(1) Clean all parts and dry thoroughly. Flush

c. Installation. Install air reservoirs as illustrated in figure 4-42. Check for air leaks.

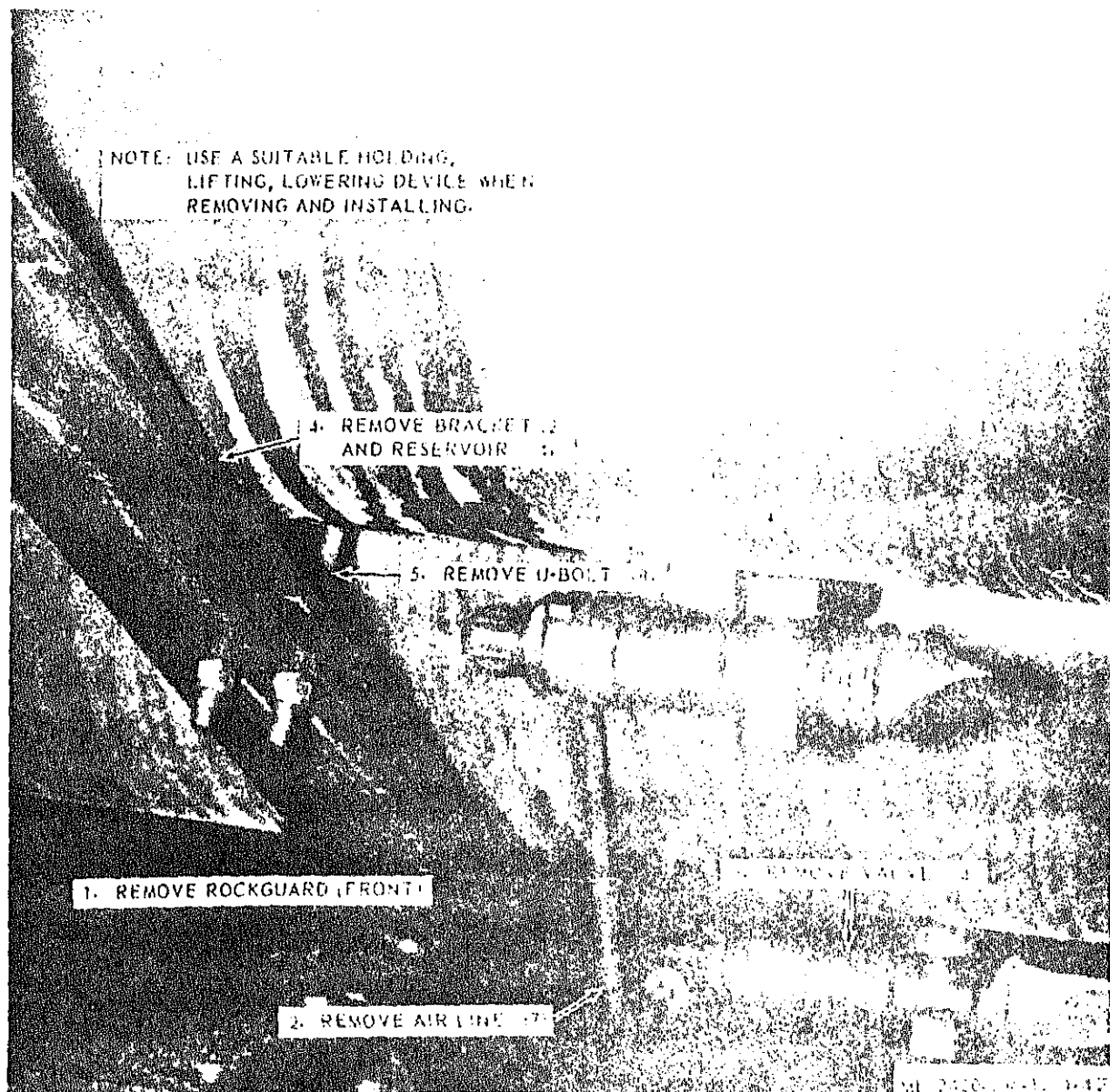


Figure 4-42. Air reservoirs, removal and installation.

4.54. Air Horns

a. Removal. Remove air horns as illustrated in figure 4-43.

b. Cleaning and Inspection.

(1) Wipe parts with a cloth and dry thoroughly.

(2) Inspect for cracks, breaks and damage. Replace defective parts as necessary.

c. Installation. Install air horns as illustrated in figure 4-43.

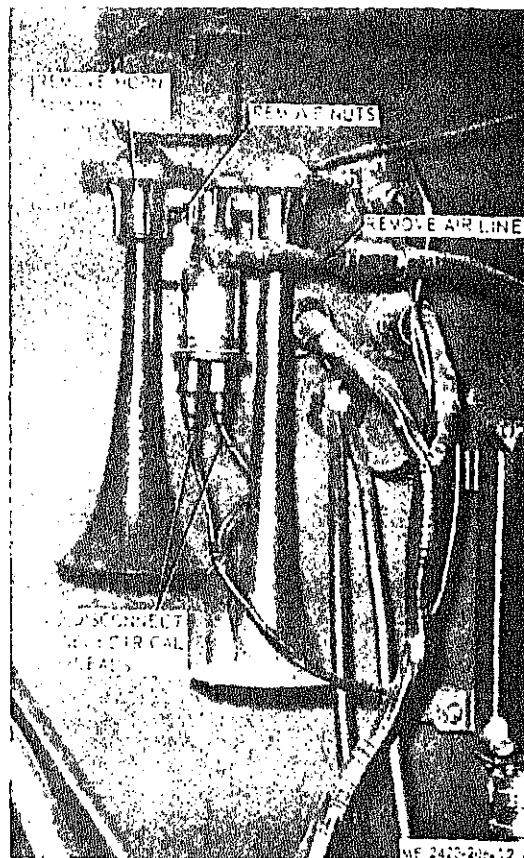


Figure 4-43. Air horns, removal and installation.

Windshield Wiper Motor

Removal. Remove windshield wiper motor as rated in figure 4-44.

Cleaning and Inspection.

1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective windshield wiper motors as necessary.

c. **Installatton.** Install windshield wiper motors as illustrated in figure 4-44.

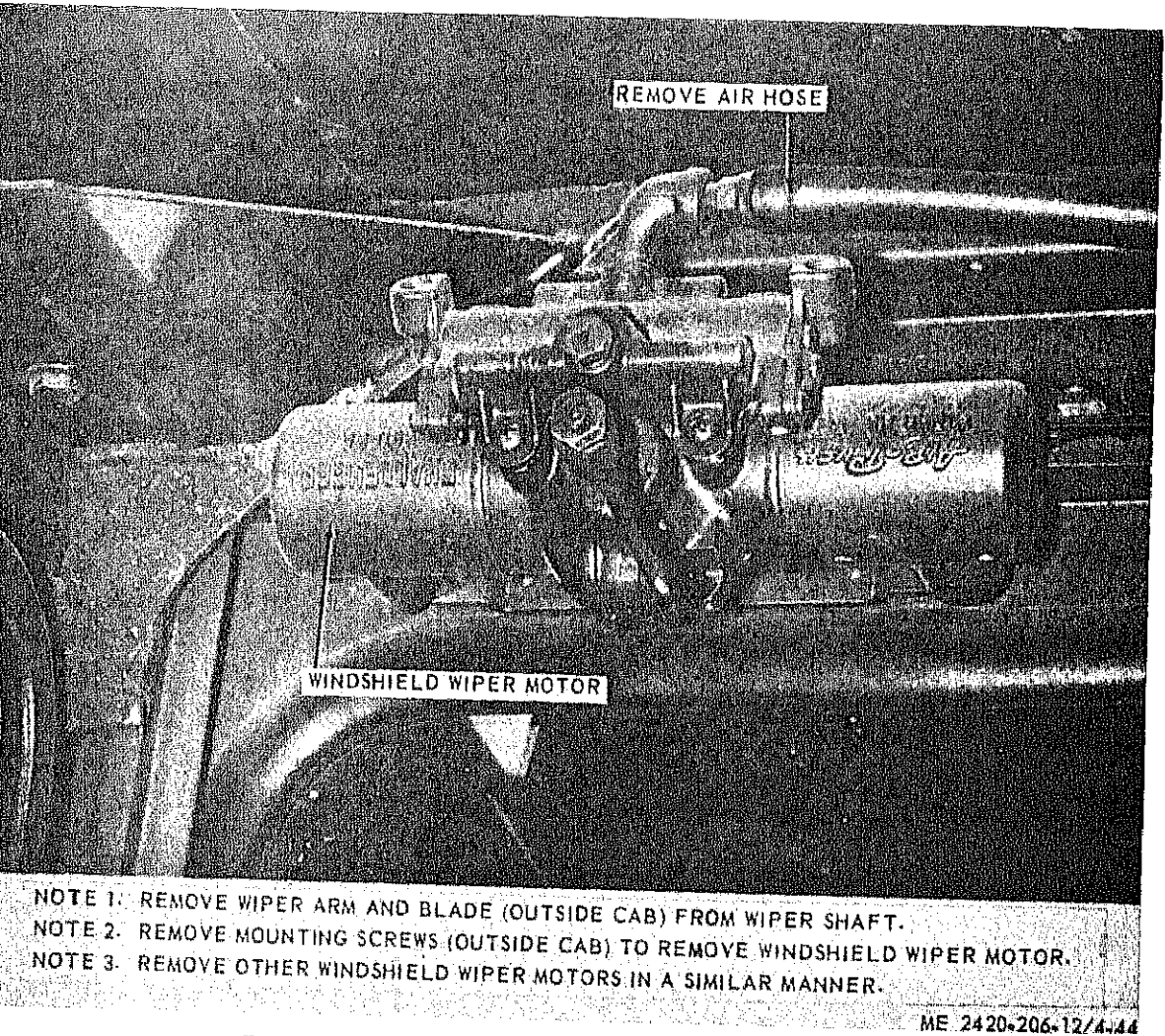


Figure 4-44. Windshteld wiper motor, removal and installation.

Tractor components contained in this section consist of items not listed in any other section.

4-57. Propeller Shaft

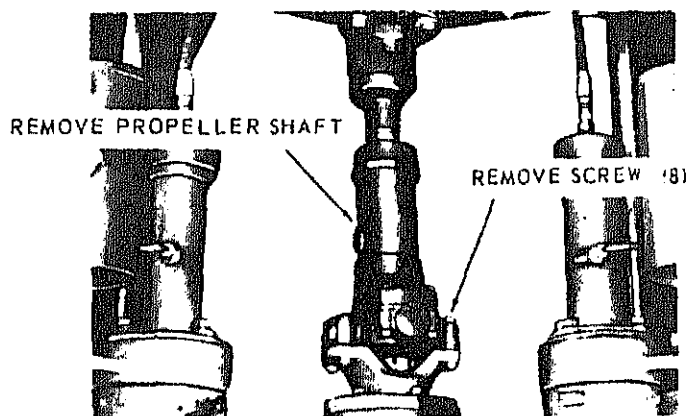
a. Removal. Remove propeller shafts as illustrated in figure 4-45. Compress shaft and remove from tractor, tap bearings with a soft hammer if necessary, to release them. Take care not to lose rollers from bearings.

b. Cleaning and Inspection.

(2) Inspect for cracks, breaks and other damage. Replace defective propeller shafts as necessary.

(3) Lubricate Midmount bearing, mount the inside front of rear frame unit, drive propeller shaft from the transmission and propeller shaft to the rear axle. Refer to LCA.

c. Installation. Install propeller shafts as illustrated in figure 4-45. Replace seals, lubricate side of bearing to retain the rollers.



REMOVE OTHER PROPELLER SHAFTS IN A SIMILAR MANNER.

ME 2420-206-12

Figure 4-45. Propeller shaft, removal and installation.

a. *Removal.* Remove rock guards as illustrated in figure 4-46.

b. *Cleaning and Inspection.*

(1) Clean parts and dry thoroughly.

age. Replace irreparable damage as necessary.

c. *Installation.* Install rock guards in figure 4-46.

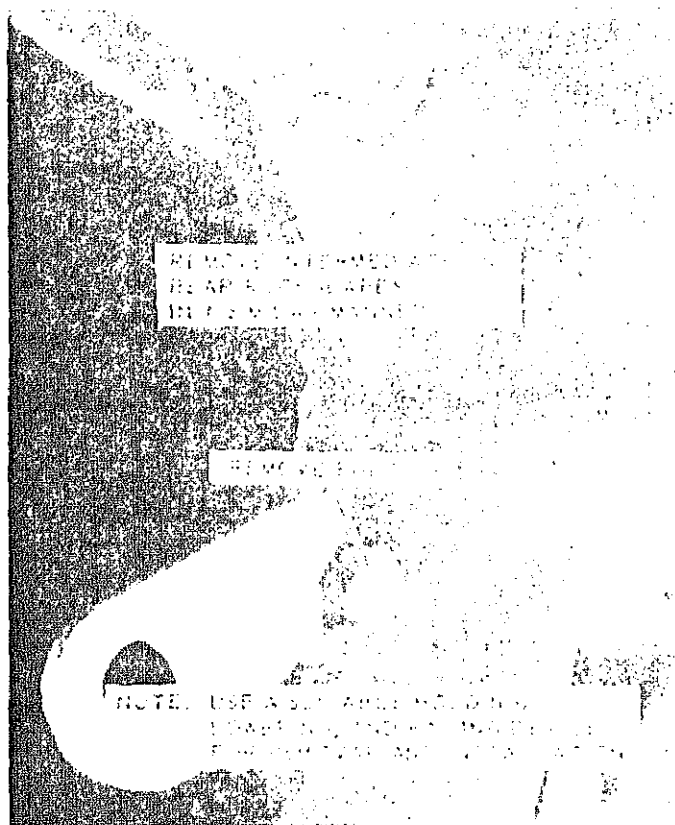


Figure 4-46. Rock guards, removal and installation.

4-59. Batteries

a. *Removal.* Remove batteries as illustrated in figure 4-47.

b. *Cleaning and Inspection.*

(1) Flush top of battery with mild solution of bicarbonate of soda. Wipe batteries with a cloth. Clean cable terminals and battery posts with emery cloth; coat lightly with grease. Inspect level of electrolyte, Table 3-1.

(2) Inspect for cracks, breaks and other damage.

(3) Test for specific gravity reading.

Note. Do not take battery to adding water. Allow engine to run for hydrometer reading. With a standard battery cell. The specific gravity reading temperature. Correct reading to compensate as prescribed in TM 9-61-10 for five batteries as necessary.

Warning: Do not smoke or flame in vicinity when servicing batteries. Batteries generate highly explosive gas.

c. *Installation.* Install batteries in figure 4-47.

3. LOOSEN SCREW
REMOVE TERMINAL 18

5. REMOVE
RETAINER (2)

4. REMOVE WINGNUT
AND WASHER (10)

6. REMOVE
WASHER (10)

7. REMOVE
WASHER (10)

8. REMOVE
WASHER (10)

60. Battery Box and Fender

a. Removal and Disassembly.

- (1) Remove batteries (para 4-59).
- (2) Remove and disassemble battery box and fender as illustrated in figure 4-48.

b. Cleaning and Inspection.

- (1) Clean battery box with a solution of water and baking soda to neutralize any acid that may have spilled on the parts. Clean parts and dry thoroughly.

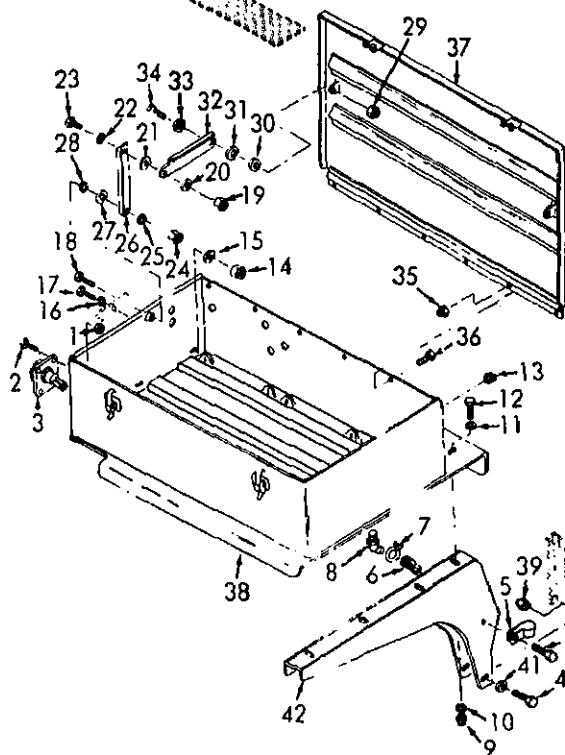
- (2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. Reassembly and Installation.

- (1) Reassemble and install battery box and fender as illustrated in figure 4-48.

- (2) Install batteries (para 4-59).

Note. Tool box and fender mounted on the left side of tractor is removed and installed in a similar manner as the battery box and fender.



ME 2420-206-12

1 Nut	22 Washer
2 Screw	23 Screw
3 Receptacle	24 Nut
4 Screw	25 Washer
5 Clip	26 Arm
6 Hose	27 Washer
7 Clamp	28 Washer
8 Fitting	29 Nut
9 Nut	30 Washer
10 Washer	31 Washer
11 Washer	32 Arm
12 Screw	33 Washer
13 Grommet	34 Screw
14 Nut	35 Nut
15 Washer	36 Screw
16 Washer	37 Cover
17 Screw	38 Box and fender asse
18 Screw	39 Nut
19 Nut	40 Screw
20 Washer	41 Washer
21 Washer	42 Bracket

Figure 4-48. Battery box and fender, exploded view

4-61. Rear Fenders

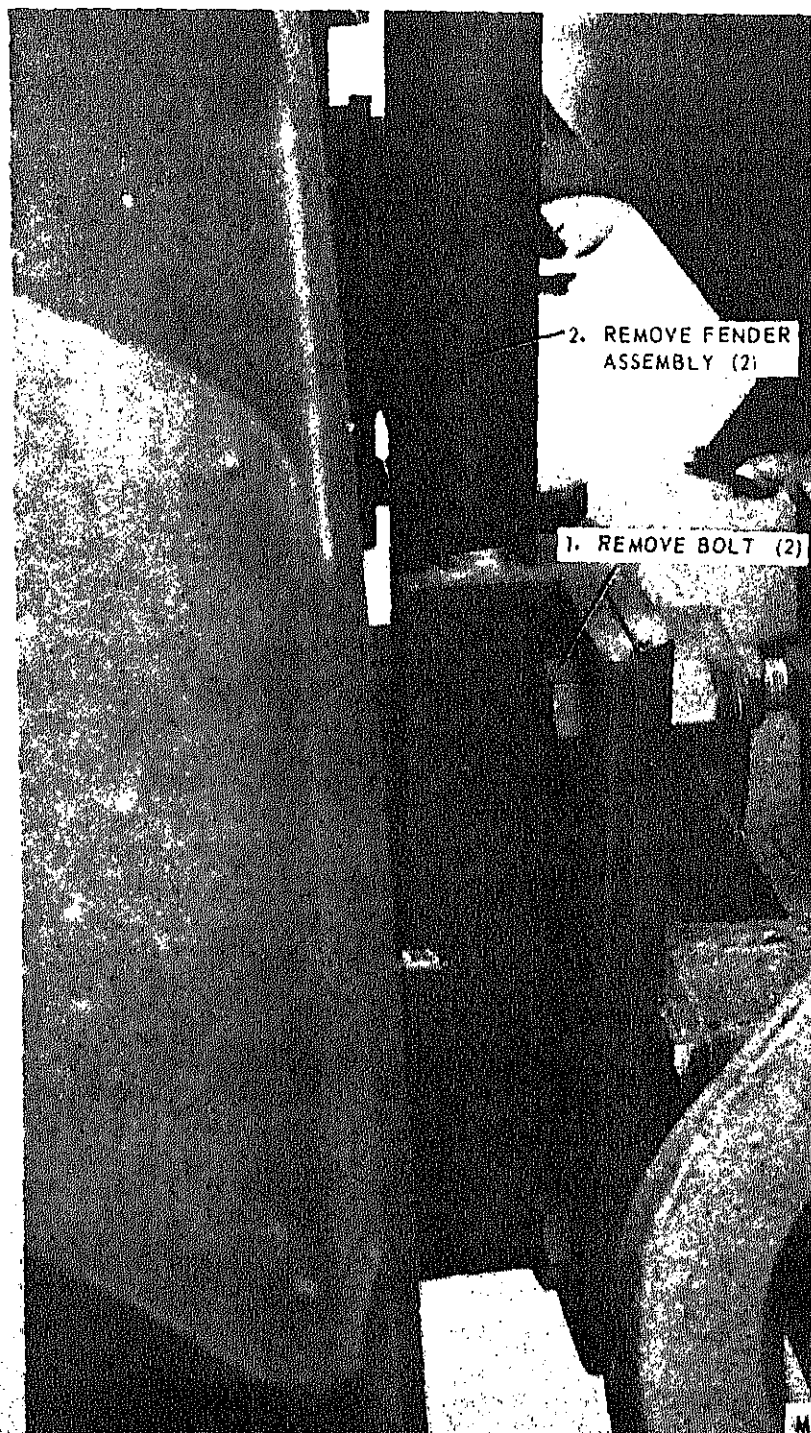
a. Removal. Remove rear fenders from tractor as illustrated in figure 4-49.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and damage. Replace unrepairable defective rear fenders as necessary.

c. Installation. Install rear fenders as illustrated in figure 4-49.



a. Removal.

(1) Remove capscrew and flat washer securing operator's seat belt and backrest to shell. Remove capscrew securing seat cushion to shell. Remove capscrew and nut securing shell to seat support. Remove passenger's seat in a similar manner.

(2) Remove seat support as illustrated in figure 4-50.

b. Disassembly. Disassemble seat support as illustrated in figure 4-51.

c. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage.

e. Replace defective parts as necessary.

d. Reassembly. Reassemble seat support in reverse order of disassembly (fig 4-51).

e. Installation. Install seat support as illustrated in figure 4-50. Install seats and seat belts in reverse order of a above.

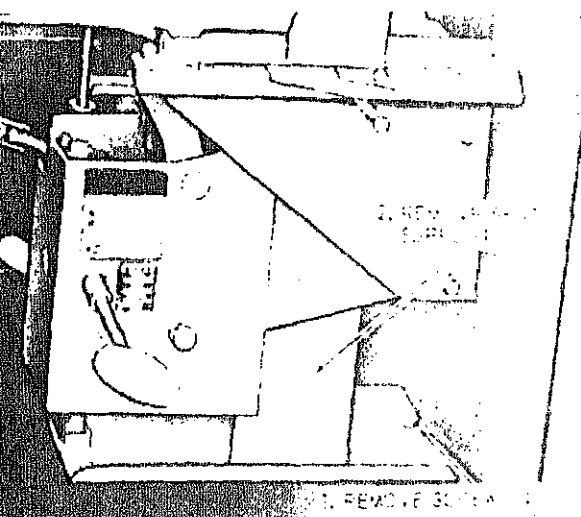


Figure 4-50. Seat support, removal and installation.

63. Tires and Wheels

a. Tire Pressure. For normal services, tires are inflated to 45 psi at both front and rear. For operation on soft earth, reduce tire pressure to 35 psi to improve traction. For operation on hard surfaced roads, increase tire pressure to 50-55 psi for less resistance and tire wear.

b. Tire Inspection. Inspect tires daily for imbedded stones, nails, or metallic particles. Remove im-

Replace missing valve caps.

c. Ballast Inflation. Each tire is provided with a hydro-inflation connector so that the tires can be filled with a calcium chloride solution to add ballast to the vehicle. The fill hole (fig 4-52) is large enough so that the plug can be removed and a hose inserted to remove all ballast from the tire without removing the tire.

d. Tire and Wheel Removal.

(1) Set parking brake. Jack up the wheel and block securely under the axle. Deflate tire. If tires are filled with ballast solution, drain through the hydro-inflator. Insert a hose into the drain port to drain all ballast from tire.

(2) Remove driver (6, fig 4-53) from wheel. Locate joint of lockring (7) and pry out lockring that locks bead seat ring to the wheel assembly. Remove flange (10) and bead seat ring (9).

Warning: Stand aside when removing lockring from tire. The lockring may snap out with enough force to cause injury.

(3) Remove tire (11), preformed packing (8) and second flange (12) from wheel (13).

(4) Remove air valve parts (1 through 5 and 14).

e. Cleaning and Inspection.

(1) Discard all preformed packings. Clean tire, wheel, and flanges with water. Remove grease and gummy deposits from metallic parts with solvent and dry thoroughly. Scrape grease from tire.

(2) Clean all other parts and dry thoroughly.

(3) Inspect outside of tires for cuts, tears, imbedded stones, or metallic particles. Remove stones or metallic particles. Skive around cuts to prevent further tearing.

(4) Inspect inside of tire for sharp projections, cuts, or ruptured cords. Inspect tire bead to make sure it is smooth and will provide a good air seal.

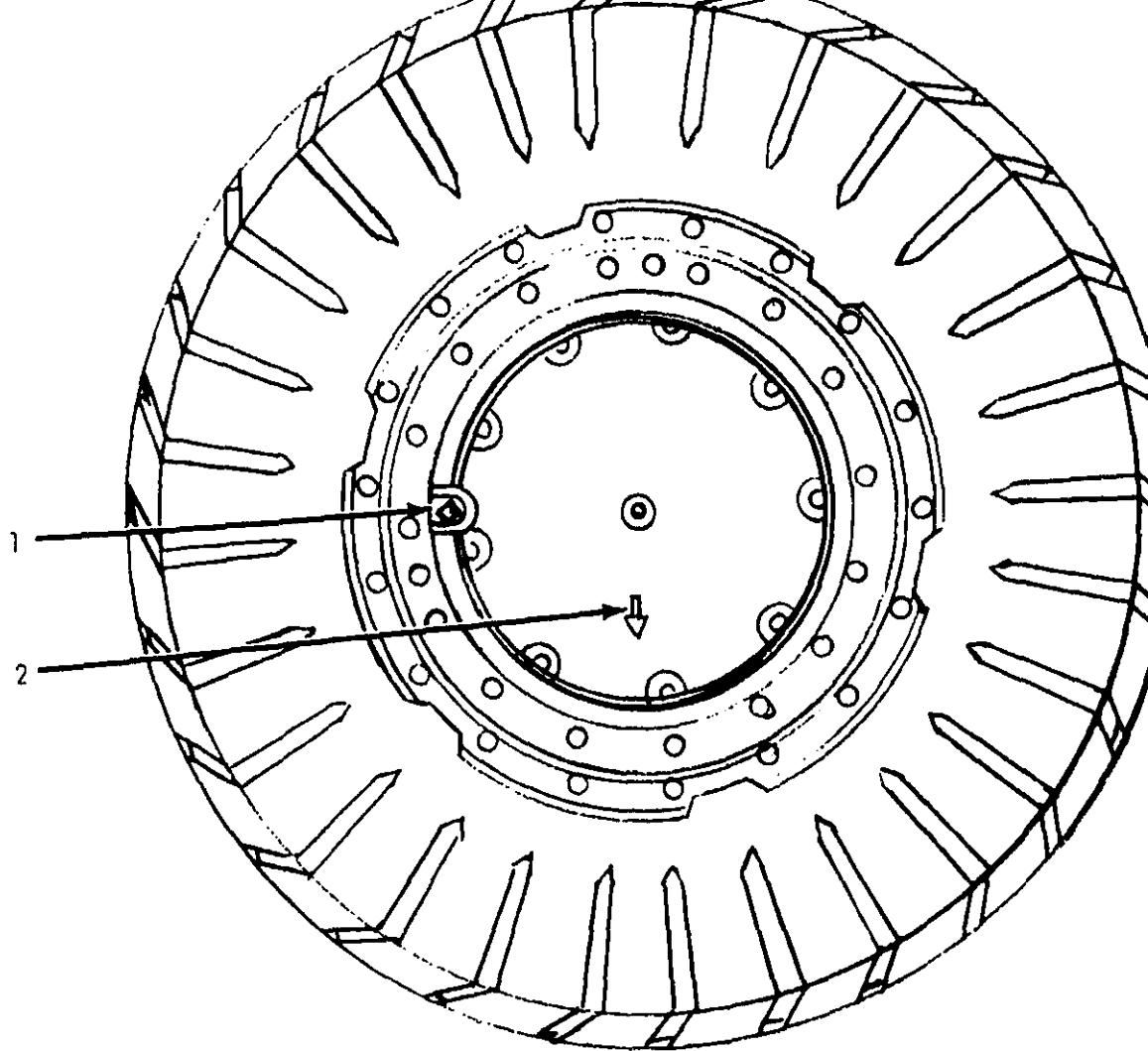
(5) Inspect wheel assembly, flanges, bead seat rings, and lockrings for cracks, distortion, gouges or burrs. Remove burrs with a stone or file.

(6) Inspect air valve parts and hydro-inflation connector parts for cracks, damaged threads, distortion, or other damage. Replace all damaged parts.

f. Tire Repair. For tubeless tire repair procedures, refer to TM 9-1870-1.

g. Installation. Install tire and wheel in reverse order of removal given in figure 4-53.

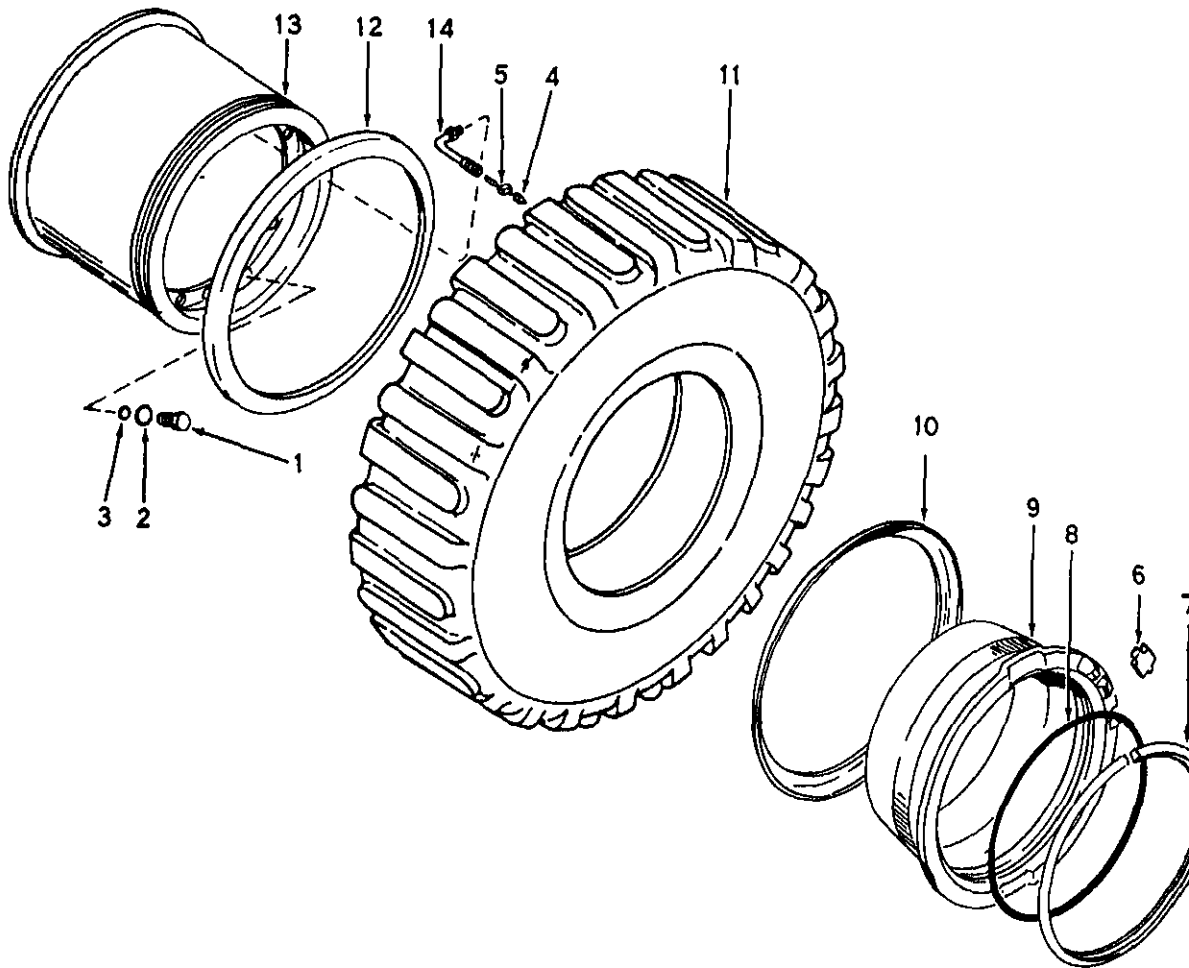
Note. Torque nuts to 650 ft.-lb. Check wheel nuts weekly.



ME 2420-206-12/4-5

- 1 Final drive fill and drain plug
- 2 Fill arrow

Figure 4-52. Wheel hub showing fill and drain plug.



ME 2420-206-12/4-

- 1 Connector plug
- 2 Preformed packing
- 3 Preformed packing
- 4 Valve cap
- 5 Core
- 6 Driver
- 7 Lockring

- 8 Preformed packing
- 9 Bead seat ring
- 10 Flange
- 11 Tire
- 12 Flange
- 13 Wheel
- 14 Valve stem

Figure 4-53. Tire and wheel, removal and installation.

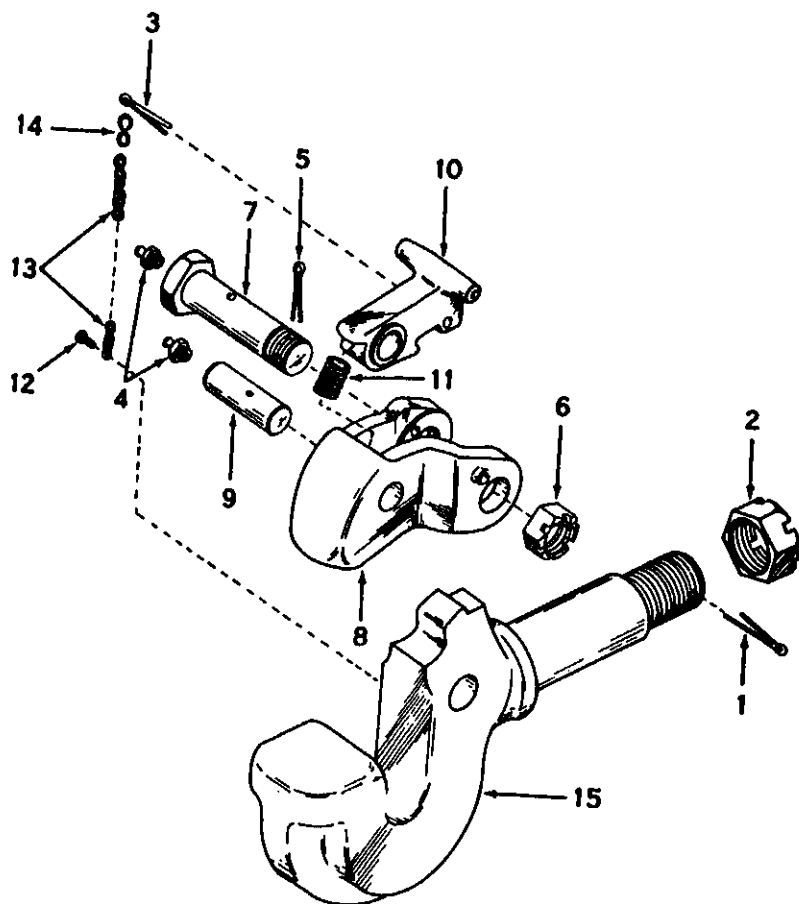
a. Removal and Disassembly. Remove pintle hook from tractor rear frame and disassemble as illustrated in figure 4-54.

b. Cleaning and Inspection.

(1) Clean all parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective parts.

c. Reassembly and Installation. Reassemble and install pintle hook on rear tractor frame as illustrated in figure 4-54.



ME 2420-206-12/4-54

- 1 Cotter pin
- 2 Nut
- 3 Cotter pin
- 4 Lubrication fitting
- 5 Cotter pin
- 6 Nut
- 7 Latch bolt
- 8 Lock

- 9 Latch pin
- 10 Latch
- 11 Spring
- 12 Drive screw
- 13 Chain
- 14 S-hook
- 15 Pintle

Figure 4-54. Pintle hook, removal, disassembly, reassembly, and installation.

55. Lunette

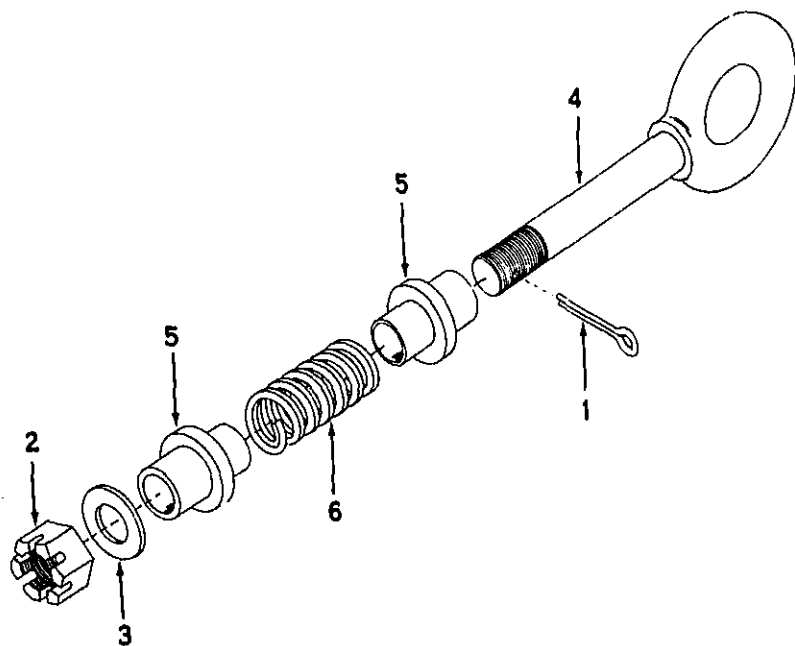
b. Removal and Disassembly. Remove lunette from center rock guard and disassemble as illustrated in figure 4-55.

c. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for damage. Replace damaged parts.

c. Reassembly and Installation. Reassemble and install lunette on center rock guard as illustrated in figure 4-55.



ME 2420-206-12/4-55

- 1 Cotter pin
- 2 Nut
- 3 Washer
- 4 Lunette
- 5 Sleeve
- 6 Spring

Figure 4-55. Lunette, removal, disassembly, reassembly, and installation.

APPENDIX A

REFERENCES

Fire Protection

5-4200-200-10 *Hand Portable Fire Extinguishers for Army Users*

Lubrication

001L *Fuels, Lubricants, Oils and Waxes*
5-2420-206-12 *Lubrication Order*

Painting

9-213 *Painting Instructions for Field Use*

Maintenance

9-1870-1 *Care and Maintenance of Pneumatic Tires*
ORD-651 *Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems*
38-750 *Army Equipment Record Procedures*
5-2420-206-20P *Operator and Organizational Repair Parts*
9-6140-200-15 *Storage Batteries, Lead Acid Type*

Shipment and Storage

38-230 *Preservation, Packaging, and Packing of Military Supplies and Equipment*
740-93-2 *Preservation of USAMEC Mechanical Equipment for Shipment and Storage*
740-90-1 *Administrative Storage of Equipment*
750-244-3 *Procedures for Destruction of Equipment to Prevent Enemy Use*

APPENDIX B BASIC ISSUE ITEMS LIST

Section 1. INTRODUCTION

B-1. Scope

This appendix lists items which accompany the tractor or are required for installation, operation, or operator's maintenance.

B-2. General

This Basic Issue Items List is divided into the following sections:

a. *Basic Issue Items — Section II.* A list of items which accompany the tractor or are required for the installation, operation, or operator's maintenance.

b. *Maintenance and Operating Supplies — Section III.* A listing of maintenance and operating supplies required for initial operation.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. *Source, Maintenance, and Recoverability Codes (SMR), Column (1):*

(1) Source code indicates the selection status and source for the listed item. Source codes are:

Code	Explanation
7	Applied to repair parts which are stocked in or supplied from CSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance categories.
A	Applied to assemblies which are not procured or stocked as such, but made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.
K	Applied to parts and assemblies which are not procured or stocked, the mortality of which is normally below that of the applicable end item, and the failure of which should result in retirement of the end item from the supply system.
K1	Applied to repair parts which are not procured or stocked, the requirement for which will be supplied by use of the next higher assembly or components.
K2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization,

Note. Source code and level of maintenance are shown on common hardware items known to be readily available in Army supply channels and through local procurement.

(2) Maintenance code indicates the low category of maintenance authorized to install listed item. The maintenance level code is

Code	Explanation
C	Operator/crew

(3) Recoverability code indicates whether serviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts (assemblies and components) which are considered economically repairable direct and general support maintenance level. When the maintenance capability to repair the items does not exist, they are normally disposed of the GS level. When supply considerations dictate some of these repair parts may be listed for automatic return to supply for depot level repair as forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. *Federal Stock Number, Column (2).* This column indicates the Federal stock number for the item.

c. *Description, Column (3).* This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. *Unit of measure, Column (4).* This column indicates the unit used as a basis for issue, e.g., each, pr, ft, yd, etc.

e. *Quantity Incorporated in Unit, Column (5).* This column indicates the actual quantity contained in the unit.

the figure number of the illustration in which the item is shown.

(2) *Item number, column (7)(b)*. Indicates the callout number used to reference the item in the illustration.

B-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies — Section III

a. *Component Application, Column (1)*. This column identifies the component application of each maintenance or operating supply item.

b. *Federal Stock Number, Column (2)*. This column indicates the Federal stock number for the

c. *Description, Column (3)*. This column indicates the item and brief description.

d. *Quantity Required for Initial Operation, Column (4)*. This column indicates the quantity required for initial operation of the equipment.

e. *Quantity Required for 8 Hours Operation, Column (5)*. This column indicates the estimated quantities required for an average eight hour operation.

f. *Notes, Column (6)*. This column indicates informative notes keyed to data appearing in the preceding column.

Section II. BASIC ISSUE ITEMS

(1) SMR Code	(2) Federal Stock Number	(3) Description Ref No. & Mfr Code	(4) Unit of Meas Usable on code	(5) Qty Inc in Unit	(6) Qty Furn with Equip	(7) Illustration	
						(A) Fig No.	(B) Id N
PC	7510-889-3494	Binder, Loose Leaf: U.S. Army Equipment Log Book	EA		1		
PC	7520-559-9618	Case: Maintenance and Operational Manuals, Cotton Duck, Water Repellant, Mildew Resistant	EA		1		
PC	4210-889-2221	Extinguisher, Fire: Dry Chemical Hand Type, 2 ½ lbs., FED. Spec. 0-E-915, Type III, Class 2, Size 2 ½ Walter Kiddie P/N 874195 or Equal	EA		1		
		DA Lubrication Order LO 5-2420-206-12	EA		1		
		DA Technical Manual TM 5-2420-206-12	EA		1		
		DA Technical Manual TM 5-2420-206-20P	EA		1		

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
CRANKCASE	9150-680-1099(2) 9150-680-1102(2) 9150-242-7603(2)	OIL, LUBRICATING: 5 gal can as follows: HDO 30 HDO 10 OES	40 qt 40 qt 40 qt	(3) (3) (3)	(1) Includes quantity of oil engine oil system as follows: 36 qts—crankcase 4 qts—oil filter (2) See FSC C9100-IL for a data and requisitioning procedure and requisitioning procedure (3) See current LO for quantities and replenishment information
FUEL TANK	9140-286-5294(2) 9140-286-5286(2) 9140-286-5283(2) 2910-565-9424	FUEL OIL DIESEL: Bulk as follows: DF-2 Regular Grade DF-1 Winter Grade DFA-Artic Grade CYLINDER, FUEL	196 gal 196 gal 196 gal 1	(4) (4) (4) (4)	(4) Tank capacity
ENGINE STARTING AID ANEROID CONTROL	9150-265-9428(2) 9150-242-7603(2)	OIL, LUBRICATING: 5 gal can as follows: OE-10 OES	2 oz 2 oz	(3) (3)	
BRAKE RESERVOIR	9150-265-9428(2) 9150-242-7603(2)	OIL, LUBRICATING OE-10 OES	2 qt ea 2 qt ea	(3) (3)	
BEARING BOX	9150-265-9428(2) 9150-242-7603(2)	OIL, LUBRICATING OE-10 OES	5 qts 5 qts	(3) (3)	
TRANSMISSION AND TORQUE CONVERTER	9150-265-9428(2) 9150-242-7603(2)	OIL, LUBRICATING OE-10 OES	72 qts 72 qts	(3) (3)	
HYDRAULIC RESERVOIR	9150-265-9428(2) 9150-242-7603(2)	OIL, LUBRICATING OE-10 OES	500 500	(3) (3)	
RADIATOR	6850-243-1990	WATER Ethylene, Glycol ANTIFREEZE: 55 gal drum as follows:	84 qts 49 qts	(3) (3)	
DIFFERENTIALS FRONT AND REAR	6850-174-1806 9150-577-5844(2) 9150-257-5440(2)	Compound Artic LUBRICATING OIL, GEAR: 5 gal drum as follows: GO-90 COS	84 qts 34 1/2 qts ea 34 1/2 qts ea	(3) (3)	

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(5) Quantity required for operation	(6) Notes
NETARIES ONT AND REAR CASE POINTS	9150-577-8544(2) 9150-257-3440(2) 9150-190-0907(2)	LUBRICATING OIL, GEAR: 5 gal drum as follows: GO-90 COS GREASE, AUTOMOTIVE AND ARTILLERY: 35 lb pail as follows: CAA	13 qts ea 13 qts ea	(3) (3) (3)	

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

1. General

a. This section provides a general explanation of maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

2. Explanation of Columns in Section II

a. *Group Number, Column (1).* The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1), Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. *Functional Group, Column (2).* This column contains a brief description of the components of each functional group.

c. *Maintenance Functions, Column (3).* This column lists the various maintenance functions (through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

- C — Operator or crew
- O — Organizational maintenance
- F — Direct support maintenance
- H — General support maintenance
- D — Depot maintenance

The maintenance functions are defined as follows:

— *Inspect.* To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

— *Test.* To verify serviceability and to de-

D — *Adjust.* To rectify to the extent necessary to bring into proper operating range.

E — *Align.* To adjust specified variable elements of an item to bring to optimum performance.

F — *Calibrate.* To determine the correction to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of instruments, one of which is a certified standard of known accuracy, to determine and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G — *Install.* To set up for use in an operating environment such as an emplacement, site or vehicle.

H — *Replace.* To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I — *Repair.* To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting and strengthening.

J — *Overhaul.* To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only Necessary (IROAN) concept.

K — *Rebuild.* To restore an item to a standard as nearly as possible to original or serviceable condition in appearance, performance and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. *Tools and Equipment, Column 4.* This column is provided for referencing by code the special tools and test equipment (Section III) required.

a. *Reference Code.* This column consists of a number and a letter separated by a dash. The number references the T&TE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K on the MAC.

b. Maintenance Level. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. *Nomenclature.* This column lists the name or identification of the tool or test equipment.

Number of tools and test equipment.

C-4. Explanation of Columns in Section I

a. *Reference Code.* This column consists of two letters separated by a dash, both of which allude to Section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

[illegible]

(1) Group No	(2) Assembly Group	(3) Maintenance Functions											(4) Tools and Equipment	Res
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
02	Clutch													
0203	Torque Converter	O	..	O	..	..	..	..	F	H	D			
	Torque Converter													
	Fittings	C	..	..	..	..	..	..	O	F	D			
	Pump Converter .....	..	..	..	..	..	..	..	F	F	D			
	Filter Assy, Oil, Element	C	..	O	..	..	..	..	O					
03	Fuel System													
0301	Fuel Injector													
	Injector assy	C	F	..	O	..	..	..	O	F				
0302	Fuel Pumps													
	Fuel pump assy .....	..	F	..	..	..	..	..	F	H	..	D		
	Screen fuel pump .....	..	..	O	..	..	..	..	O					
0304	Air Cleaner													
	Air cleaner assy .....	..	..	O	..	..	..	..	O	O	..	..		D
0305	Turbocharger													
	Turbocharger assy	C	..	O	..	..	..	..	O	F		D		E
0306	Tanks, Lines, Fittings													
	Tank assy, screen	C	..	C	..	..	..	..	F	O	..	..		F
	Valve, fuel shut down ...	O	..	..	..	..	..	..	O	O				
	Aneroid assy, filter .....	..	..	O	..	..	..	..	O	O				
	Hoses, lines & fittings ...	O	..	..	..	..	..	..	O					
0308	Engine Speed Governor													
	Governor	H	..	..	..	..	..	..	H					
0309	Fuel Filters													
	Filter assy, element	C	..	O	..	..	..	..	O	O				
0311	Engine Starting Aids													
	Quick start assy	C	..	C	..	..	..	..	O					
0312	Accelerator, Throttle													
	Controls Linkage	C	..	C	..	..	..	..	O					
04	Exhaust System													
0401	Muffler and pipes													
	Muffler and pipes	C	..	..	..	..	..	..	O					
05	Cooling System													
0501	Radiator													
	Radiator assy	C	..	C	..	..	..	..	F	F				
0502	Cowling, Deflector, Air													
	Duct & Shrouds													
	Grille	O	..	..	..	..	..	..	O					
0503	Water Manifold, Thermo-													
	stats Housing, gasket													
	Hoses, lines & fittings ...	C	..	..	..	..	..	..	O					
	Water manifolds	C	..	..	..	..	..	..	F					
	Thermostat .....	..	O	..	..	..	..	..	O					
0504	Water Pump													
	Water pump assy .....	..	..	C	..	..	..	..	F	F				
	Belt	C	..	..	O	..	..	..	O					
0505	Fan Assy													
	Fan assy .....	..	..	..	..	..	..	..	O	F				
	Belt, fan drive	C	..	..	O	..	..	..	O					
0508	Water Filter													

Group No		A	B	C	D	E	F	G	H	I	J	K	Equip
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	
06	Electrical System												
0601	Generator												
	Generator assy	O	O	C					O	O		D	
	Belt	C			O				O				
0602	Generator, Regulator												
	Regulator voltage	O	O		F				O	H			
0603	Starting Motor												
	Motor, cranking	O	O	O					O	O		D	
	Solenoid	O	O						O				
	Plunger								O				
	Drive clutch	O							F				
	Wiring	O							O				
0607	Engine Control Panel												
	Gages	O							O				
	Switches, lights, panel & circuit breakers		O						O				
	Bulbs	C							C				
	Wiring panel	C							O				
	Panel	O							O				
0608	Miscellaneous Items												
	Utility outlet	C							O				
	Receptacle, battery	C							O				
0609	Lights												
	Light assemblies	C		C					O				
	Lamp incandescent	C							C				
0610	Sending Units & Warning												
	Switches												
	Sending units		O						O				
	Warning switch, over speed device		O						O				
0611	Horn												
	Horn, Vehicular & warning		O						O				
	Wiring	O							O				
0612	Batteries, Storage												
	Batteries	C	O	C				C	O				
	Wiring							C	O				
0613	Hull or Chassis Wiring												
	Harness												
	Harness wiring								F	O			
07	Transmission												
0704	Control shaft	C							O				
0710	Transmission Assy	C		O					F	H		D	
0713	Intermediate Clutch												
	Clutch assemblies								H	H			
0714	Servo Unit												
	Control valve	C							F	F			
0720	Accessory Drive								F	F			
	Speedometer drive												
0721	Coolers, Pumps, Motors												
	Pump, push start								O	F			

[illegible]

(1) Group No.	(2) Assembly Group	(3) Maintenance Functions											To Eq
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	
1410	Hydraulic Pump												
	Pump assy .....	..	F	..	..	..	..	..	F	F			
1411	Hoses, Lines & Fittings												
	Hoses, lines & fittings ...	C	..	..	..	..	..	..	O				
1412	Hydraulic Cylinders												
	Cylinder, hydraulic	C	..	..	..	..	..	..	O	O			
15	Frame												
1501	Frame assembly												
	Frame	C	..	..	..	..	..	..	H	O	..	..	..
	Rock guards, ladders	C	..	..	..	..	..	..	O	O			
1503	Pintles & Towing Attach- ments												
	Lunette	C	..	..	..	..	..	..	O				
	Pintle	C	..	C	..	..	..	..	O	O			
1506	Universal Coupler												
	Coupler, universal	C	..	C	..	..	..	..	F	F			
18	Body, Cab, Hood												
1801	Body, cab, hood												
	Body, cab	C	..	..	..	..	..	..	F	O	..	..	..
	Hod	C	..	..	..	..	..	..	O	O	..	..	..
	Glass	C	..	..	..	..	..	..	F				
1805	Floors												
	Floorplates	O	..	..	..	..	..	..	O				
1806	Seats												
	Seat	C	..	..	..	..	..	..	O	O			
	Seat-belt	C	..	..	..	..	..	..	O				
1808	Tool Box												
	Box, tool	C	..	..	..	..	..	..	O	O			
22	Body Chassis or Hull & Accessory Items												
2202	Accessory Items												
	Wiper assy	O	..	..	..	..	..	..	O				
	Blade	O	..	..	..	..	..	..	O				
43	Hydraulic & Air System												
4300	Hydraulic system												
	Hydraulic system	C	..	C	..	..	..	..	..	O			
4301	Strainers, Filters, Hose Lines, & Fittings												
	Strainers, filters	C	..	C	..	..	..	..	O				
	Hose, lines & fittings ..	C	..	..	..	..	..	..	O				
	Swivels	C	..	C	..	..	..	..	O	O			
4302	Pump & Pump Drive												
	Pump hydraulic	C	..	..	..	..	..	..	F	F			
	Drive, pump .....	..	..	..	..	..	..	..	H	H			
4305	Control Valves												
	Valves, control .....	..	..	..	..	..	..	..	O	O			
4307	Hydraulic Cylinders												
	Cylinder, hydraulic	C	..	..	..	..	..	..	O	O			
4308	Reservoir												
	Reservoir assy	C	..	..	..	..	..	..	O	O			

(1) Group No	(2) Assembly Group	(3) Maintenance Functions											(4) Tools and Equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
4701	Gages, (Non-Electrical) Instruments													
	Speedometer & drive shaft	C	..	0	..	..	..	..	0	F				
	Adapter	..	..	..	..	..	..	..	F	F				
	Tachometer	0	..	..	..	..	..	..	0					
	Adapter	..	..	0	..	..	..	..	0					
4702	Gages, Mounting Lines & Fittings Gages, mounting lines & fittings	0	..	..	..	..	..	..	0					
4703	Hourmeter													
	Hourmeter	0	..	..	..	..	..	..	0					
	Pneumatic Equipment													
5001	Cylinder & Head Assy	..	..	..	..	..	..	..	F	F				
	Cylinder & head assy	..	..	..	..	..	..	..
5002	Crank Shaft Assy	..	..	..	..	..	..	..	F	F				
	Crank shaft assy	..	..	..	..	..	..	..
5004	Piston, Connecting Rod & Rings Piston, connect- ing rod & rings	F	..	..	..	..	..	..	F					
5005	Valves	F	..	..	..	..	..	..	F					
	Valves	..	..	..	..	..	..	..
5007	Compressor Drive	F	..	..	..	..	..	..	F					
	Compressor drive	..	..	..	..	..	..	..
5008	Air Intake	F	..	..	..	..	..	..	F					
	Air intake	..	..	..	..	..	..	..
5009	Unloader System													
	Components													
	Unloader system components	F	..	..	..	..	..	..	F					
5012	Throttling Devices	..	..	..	..	..	..	..	F	F				
	Governor	..	..	..	..	..	..	..
5015	Air Discharge System	0	..	..	..	..	..	..	0					
	Lines & fittings	..	..	..	..	..	..	..
7435	Earth Moving Components													
	Moldboard assy	..	..	..	..	..	..	..	0	H				
	Moldboard assy	..	..	..	..	..	..	..
7440	Scarifier Assy	..	..	..	..	..	..	..	0	0				
	Scarifier assy	..	..	..	..	..	..	..
7447	Push Beam & Yoke													
	Components													
	Push beam & yoke components	..	..	..	..	..	..	..	0	0				

Reference Code	Maintenance level	Nomenclature	Tool number
1 - I	F	Grooving Tool, Injector Sleeve Installation (Cummins Diesel Co. Topic No. 2-73A)	ST-1100

Section IV. REMARKS

Reference code	Remarks
A—B	Compression test
B—C	Oil pump sump screen
C—I	Weld only
D—I	Weld only
E—C	Clean impeller and diffuser only
F—I	Weld only
G—I	Repair kit only
H—I	Repair kit only
I—B	Test after welding
J—I	Weld only
K—I	Includes welding as required
L—I	Weld only
M—I	Weld only

INDEX

	Paragraph	Page
Accelerator pedal and linkage	4-25	4-33
Actuator, brake	4-50	4-60
Adjustment, engine timing	4-39, 4-40	4-48
Aid, engine starting	4-20	4-15
Air cleaner filter service	3-8	3-6
Air cleaner pipe and hood	4-17	4-13
Air horns	4-54	4-67
Air hydraulic system	4-49	4-60
Air reservoirs	4-53	4-66
Air valve, brake relay	4-51	4-64
Aneroid	4-35	4-45
Aneroid filter service	3-10	3-10
Aneroid	4-15, 4-16	4-12
Assembly, blackout headlight	4-12	4-11
Assembly, bulldozer	4-8	4-8
Assembly, floodlight	4-11	4-11
Assembly, headlight	4-9, 4-10	4-9
Assemblies, tail, stoplight, blackout tail and stoplight	4-13	4-11
Batteries	4-59	4-70
Battery box and fender	4-60	4-72
Belt, water pump	4-38	4-47
Blackout headlight	4-12	4-11
Body, scarifier	4-5	4-2
Brake actuator	4-50	4-60
Brake control trailer	4-21	4-25
Brake hand lever, parking	4-24	4-32
Brake relay air valve	4-51	4-64
Breaker, circuit	4-20	4-15
Breather service (small)	3-12	3-11
Bulldozer assembly	4-8	4-8
Bulldozer control levers	4-22	4-27
Bulldozer hydraulic valve	4-47	4-58
Circuit breaker	4-20	4-15
Controls and instruments	2-8, 4-19, 4-20	2-6, 4-15
Control levers, bulldozer	4-22	4-27
Control levers, transmission	4-23	4-29
Control panel lights	3-14	3-15
Conversion of equipment	2-4	2-1
Coolant thermstat	4-30	4-41
Corrosion resistor (water filter)	4-31	4-41
Coupling	4-43	4-50
Cutting edge, bulldozer	4-3	4-1
Cylinders, bulldozer	4-7	4-4
Cylinder, steering	4-46	4-56
Deep water or mud operation	2-18	
Detailed lubrication	3-4	
Description	1-3	
Dismantling for movement	2-5	
Drag link assembly	4-21	
Drive pulley, fan	4-37	
Dusty or sandy area operation	2-15	
Emergency engine starting	2-23	
Engine speed governor (indicating)	4-36	
Engine Timing	4-39, 4-40	
Engine oil system service	3-5	

Exhaust pipe	4-16	4-12
Fan drive pulley	4-37	4-47
Fender and battery box	4-60	4-72
Fenders, rear	4-61	4-73
Filter base, hydraulic oil	4-44	4-54
Filter head, oil, engine and turbocharger	4-32	4-41
Filter head, fuel	4-33	4-42
Filter service, air cleaner	3-8	3-6
Filter service, aneroid	3-10	3-10
Filter service, fuel pump	3-11	3-11
Filter service (corrosion resistor)	3-9	3-9
Fire extinguisher	2-20	2-18
Floodlight assembly	4-11	4-11
Floorplates	4-47	4-58
Forms, record and report	1-2	1-1
Fuel injectors	4-41	4-49
Fuel shut down valve	4-34	4-43
Fuel system service	3-6	3-3
General lubrication	3-3	3-1
Generator	4-28	4-37
Generator regulator	4-29	4-38
Grill	4-10	4-9
Guards, rock	4-58	4-70
Headlight assembly	4-9, 4-10	4-9
High altitude operation	2-19	2-18
Hood	4-17	4-13
Horns	4-54	4-67
Hydraulic air system (brake)	4-49	4-60
Hydraulic cylinder, steering	4-46	4-56
Hydraulic Oil filter base	4-44	4-54
Hydraulic oil system service	3-7	3-5
Hydraulic system	4-43	4-50
Hydraulic valves	4-47, 4-48	4-58, 4-59
Humid or rainy operation of equipment	2-16	2-18
Identification	1-4	1-13
Injector, fuel	4-41	4-49
Inspection and servicing	2-1	2-1
Installation, setting up	2-2, 2-3	2-1
Instrument panel	4-20	4-15
Instruments and controls	2-8, 4-19, 4-20	2-6, 4-15
Intake manifold	4-18	4-13
Lamp, tractor light	3-15	3-15
Levers, bulldozer control	4-22	4-27
Lever, hand brake	4-24	4-32
Levers, transmission control	4-23	4-29
Lights, control panel	3-14	3-15
Linkage, accelerator pedal	4-25	4-33
Lubrication	3-3, 3-4	3-1
Lunette	4-65	4-79
Maintenance, repair parts	3-2	3-1
Manifold	4-18	4-13
Motor, windshield wiper	4-55	4-68
Operation of equipment	2-12 — 2-19	2-12, 2-18
Operator seat	2-22	2-20
Operator, organizational repair parts	3-2	3-1
Panel, instrument	4-20	4-15
Parking brake	4-24	4-32

	Paragraph	Page
Propeller shaft	4-57	4-69
Protection valve	4-52	4-65
Pump, push start	4-45	4-55
Pump, water	4-38	4-47
Pulley, fan drive	4-37	4-47
Push beam assembly	4-8	4-8
Rear fenders	4-61	4-73
Record and report forms	1-2	1-1
Regulator, generator	4-29	4-38
Reinstallation after movement	2-6	2-6
Relay air valve, brake	4-51	4-64
Repair, wiring harness	4-14	4-11
Reservoirs, air	4-53	4-66
Rock guards	4-58	4-70
Scarifier	4-4, 4-5	4-1, 4
Scraper valve	4-48	4-59
Scope	1-1	1-1
Seat support	4-62	4-74
Separately packed items	2-2	2-1
Service air cleaner filter	3-8	3-6
Service aneroid filter	3-10	3-10
Service breather (small)	3-12	3-11
Service engine oil system	3-5	3-1
Service fuel pump filter	3-11	3-11
Service fuel system	3-6	3-3
Service hydraulic oil system	3-7	3-5
Service water filter	3-9	3-9
Servicing and inspection	2-1	2-1
Setting up, installation	2-3	2-1
Shaft, propeller	4-57	4-69
Shutdown valve, fuel	3-34	
Speed governor	4-36	4-46
Starter and solenoid	4-27	4-35
Starting	2-10	2-10
Starting aid, engine	2-21, 4-20	2-18, 4-56
Steering cylinder	4-46	4-56
Steering scraper hydraulic system	4-42, 4-43	4-50
Steering wheel	4-21	4-25
Stopping	2-11	2-12
Skid shoe	4-6	4-4
Switch, stop light	4-52	4-65
Swivels	4-43	4-50
Tabulated data	1-4	1-13
Tail and stoplight assemblies	4-13	4-11
Timing adjustment, engine	4-39, 4-40	4-48
Tires	4-63	4-74
Thermostat, coolant	4-30	4-41
Tools and equipment	3-1	3-1
Tooth, scarifier	4-4	4-1
Torque Converter oil system service	3-7	3-5
Tractor engine emergency starting	2-23	2-21
Tractor light lamps	3-15	3-15
Trailer brake control	4-21	4-25
Transmission control levers	4-23	4-29
Transmission oil system service	3-7	3-5
Turbocharger	4-15, 4-16, 4-18	4-12, 4-14
Turbocharger, oil filter head	4-32	4-41

Water pump	4-38	4-47
Wheel	4-63	4-74
Wheel, steering	4-21	4-28
Windshield wiper	4-55	4-68
Wiring harness	4-14	4-11

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